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March 30, 31, and April 1, 1978

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Pullman, Washington 99164

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WITH COLLABORATION OF NORTHWEST SCIENTIFIC ASSOCIATION

51st ANNUAL MEETING

OF THE

NORTHWEST SCIENTIFIC ASSOCIATION

INCLUDING SYMPOSIUM:

"SCIENCE, EDUCATION, AND SOCIETY"

WASHINGTON STATE UNIVERSITY

PULLMAN, WASHINGTON 99164

MARCH 30, 31, and APRIL 1, 1978

NORTHWEST SCIENTIFIC ASSOCIATION
Schedule of Events

Annual Meeting
March 30, 31, & April 1, 1978

WASHINGTON STATE UNIVERSITY
Pullman, Washington

Thursday, March 30, 1978

4:00 p.m. - 6:00 p.m.	Registration	Todd Aud.
7:00 p.m. - 8:00 p.m.	Board meeting, 1977-78 Officers, Chairpersons, Trustees	New Heald 171
7:00 p.m. - 8:30 p.m.	Chemistry-Physics Section, Workshops	

Friday, March 31, 1978

7:30 a.m. - 11:00 a.m.	Registration	Todd Aud.
8:00 a.m. - 12:00 a.m.	NWSA Sessions:	
8:30 - 11:45	Botany	Todd 122 & 128
9:00 - 11:35	Chemistry-Physics	Todd 201
8:30 - 11:45	Forestry	Todd 105 & 107
9:40 - 12:00	Geology	Todd 134
8:00 - 12:00	Science & Math Education	Todd 144
8:30 - 11:45	Social Science	Todd 203
10:00 - 11:45	Soil & Water	Todd 109 & 140
8:30 - 11:35	Zoology	Todd 202 & 204
12 noon -1:00 p.m.	Luncheon and Business Meeting of NWSA	Compton Union Building
1:15 p.m. - 5:00 p.m.	NWSA Sessions continued:	
1:25 - 4:30	Botany, Chemistry-Physics, Science & Math Education, Social Science, Soil & Water	Symposium, Todd Aud.
1:15 - 5:00	Forestry	Todd 105
1:20 - 5:00	Geology	Todd 134
1:00 - 4:00	Zoology	Todd 202
1:25 p.m. - 4:30 p.m.	Symposium: "Science Education and Society"	Todd Aud.
6:00 p.m. - 7:00 p.m.	Pre-banquet Social Hour	Holly's, S.E. 915 Main
7:30 p.m. - 8:30 p.m.	NWSA Banquet	CUB Ballroom
8:30 p.m. - 9:30 p.m.	Banquet & Concluding Symposium Speaker	

Saturday, April 1, 1978

7:00 a.m. - 8:00 a.m.	Breakfast	Compton Union Building
8:00 a.m. - 12:00 noon	NWSA Sessions continued:	
8:00 - 11:50	Botany	Todd 122 & 128
8:30 - 12:00	Chemistry-Physics	Todd 201
8:00 - 11:40	Forestry	Todd 105 & 107
8:10 - 12:00	Science & Math Education	Todd 144
9:00 - 12:00	Social Science	Todd 203
8:30 - 12:00	Soil & Water	Todd 109 & 140

Symposium

SCIENCE, EDUCATION, AND SOCIETY

March 31, 1978

Todd Auditorium

1:25 Introductory Remarks
Dr. G. A. Crosby, Professor of Chemistry and Chemical Physics, Washington State University

1:35 "Problems of Education in the Health Sciences"
Dr. Maureen Henderson, Assistant Vice President for Health Affairs, University of Washington

2:20 "Can We Keep Abreast of Our Technology?"
Dr. Richard Gibb, President, University of Idaho

3:05 "Toward a National Energy Policy"
Hon. Mike McCormack, Congressman, 4th District

Final Symposium Address (Banquet Address)
"The Role of Basic Research in Our Society"
Dr. George Pimentel, Deputy Director
National Science Foundation

March 31, 1978 Morning Session

Session 1. Ecology I Contributed Papers
Presiding: Dr. W. R. Rayburn, Washington State University

8:30 "Multivariate Analyses of Community Patterns in Two Disjunct Amphitropical Deserts" by Goldstein, G. H. and R. del Moral, University of Washington. (1)

8:50 "Variations in Pattern and Density Estimates Using Point to nth Nearest Individual or nth Nearest Neighbor Distance Measures in k Sectors" by Baldwin Jr., V. C., Washington State University. (2)

9:10 "Linear Vegetation Patterns Associated with Bedrock Joints in Pine Woodlands of Eastern Washington" by Folsom, M. M., Eastern Washington University. (3)

9:30 "Classification and Dynamics of the Vegetation of the Nooksack Canyon, North Cascades National Park" by Adams, A. B., Oliver, C. D. and R. del Moral, University of Washington. (4)

9:50 "Simulation Modelling of Black Spruce Reproduction near Treeline" by Black, R. A., University of Calgary. (5)

10:15 Intermission

10:30 "A conceptual Model of Secondary Succession" by Hironaka, M., University of Idaho. (6)

10:45 "Why are Algae Shaped That Way? Form, Physiological Tolerance and Predation" by Slocum, C. J., and R. del Moral, University of Washington. (7)

11:15 "Phenology of the Trees, Shrubs and Forbs in a Second Growth Forested Area of Western Washington" by Kiser, R. W., Centralia Community College. (8)

11:45 Lunch

March 31, 1978 Morning Session

Session 2. Taxonomy I Contributed Papers
Presiding: Dr. A. J. Gilmartin, Washington State University

8:30 "Taxonomic Value of Stomatal Types in Selected Umbelliferae Genera" by Gill, S. J., Washington State University. (9)

8:45 "A Biosystematic Study of Camassia Cusickii Wats. and its Allies (Liliaceae)" by Jewell, J. E., University of Idaho. (10)

9:00 "Alpine Flora of East-Central Idaho" by Brunsfeld, S. J., University of Idaho. (11)

9:15 "The Air-Borne Pollens of Walla Walla, Washington" by Anderson, E. F., Dorsett, C. S., and E. O. Fleming, Whitman College. (12)

9:30 "Who Cares About Sex, A Computer-Generated Vegetative Key to the Grasses" by Besand, D. L., Washington State University. (13)

9:45 "A Study of Two Chimeral Varieties of Sansevieria trifasciata" by Bobisud, H. M., University of Idaho. (14)

10:00 "Coevolution of Six Species of Pedicularis and their Bombus Pollinators" by Adams, V., University of Washington. (15)

10:15 Intermission

10:25 "Species Question Concerning Taraxacum Officinale and T. Laevigatum" by Kennison, J., and R. Taylor, Western Washington University. (16)

10:40 "Variation in Populations of Bromus tectorum L. in Eastern Washington" by Bookman, P. A., Washington State University. (17)

10:55 "A Floristic Study in Northern Del Norte County, California" by Barker, L. M., Humboldt State University. (18)

11:15 "Counts of Vascular Bundles in the Genus Allium" by Jacobsen, T. D., Washington State University. (19)

11:25 "Hybridization in Foxtail and Bristlecone Pines" by Mastrogiuseppe, R. J., and J. D. Mastrogiuseppe, University of Idaho. (20)

11:45 Lunch

April 1, 1978 Morning Session

Session 3. Ecology II Contributed Papers
Presiding: Dr. W. R. Rayburn, Washington State University

8:30 "The Ecology of the Grasslands of the Cypress Hills Provincial Park and the Effects of Grazing" by Lewis, G., University of Calgary. (21)

8:50 "Competition Between Two Species of Alpine Fescue" by Belsky, J., University of Washington. (22)

9:10 "Life Cycles of Herbaceous Plants in Two Western Washington Meadow Communities" by Jackson, L. E., University of Washington. (23)

9:30 "The Use of Stable Sulfur Isotopes to Monitor the Accumulation of SO_2 Pollution in Terrestrial Plants, Duff, and Soils" by Winner, W. E., Bewley, J. D., and H. R. Krouse, University of Calgary. (24)

9:50 "Fluoride Injury to Douglas Fir in Northwest Whatcom County, Washington" by Basabe, F. A., and R. J. Taylor, Western Washington University. (25)

10:05 "Sulfur Dioxide Effect in Northwestern Whatcom County, Washington" by Taylor, R. J., Western Washington University. (26)

10:20 Intermission

10:30 "Algal Community Dynamics in an Eastern Washington Silt Loam" by Metting, B., Washington State University. (27)

10:45 "Vegetation and Power Peaking on the Columbia River" by Stocker, R. K., Washington State Department of Game. (28)

11:00 "Geographical Variation in the Morphology of Picea sitchensis in California" by Stekel, P., Humboldt State University. (29)

11:15 "Terpene Analysis of Abies lasiocarpa in California and Oregon" by Cope, E. A., Humboldt State University. (30)

11:30 "Ecologic Implications of Conifer Tissue Water Parameters" by Jackson, P. A., and G. G. Spomer, University of Idaho. (31)

BOTANY SECTION

April 1, 1978 Morning Session

Session 4. Morphology/Physiology I Contributed Papers
Presiding : Dr. G. G. Spomer, University of Idaho

8:30	"Accelerating Decay of Forest Residues - Techniques for Evaluation" by Blanchette, R. A., and C. G. Shaw, Washington State University.	(32)
8:45	"In Vivo Basidiospore and Chlamydospore Production in Cryptoporus volvatus" by Harrington, T. C., Blanchette, R. A., and C. G. Shaw, Washington State University.	(33)
9:00	"Fungal Sporocarp Phenology in an Oregon Coast Range Douglas-fir Forest" by Hunt, G. A., Oregon State University.	(34)
9:20	"The Role of Selenium in the Evolution of Allium aaseae Ownbey" by Holsinger, K. E., The College of Idaho.	(35)
9:35	"Internode Elongation in Monocotyledons" by Naskali, R. J., University of Idaho.	(36)
9:55	Intermission	
10:10	"Antibody Inhibition of Abscisic Acid in Stomates" by Spomer, G. G., and K. A. Laurence, University of Idaho.	(37)
10:30	"Inhibition of the Cytodifferentiation of Tracheary Elements In Vitro by a Kinetin Antibody" by Roberts, L. W., Laurence, K. A., and D. J. Johnson, University of Idaho.	(38)
10:45	"Growth and Development of Peach Mesocarp Tissue In Vitro" by Kupferman, E. M., and W. H. Loescher, Washington State University.	(39)
11:00	"Isolation of Sorbitol Dehydrogenase from Plant Tissue" by Negm, F. B., and W. H. Loescher, Washington State University.	(40)

CHEMISTRY-PHYSICS SECTION

March 30, 1978 Evening

7:00-8:30 Workshops

March 31, 1978 Morning Session
Presiding: Dr. A. Keith Dunker, Washington State University, Fulmer 638

Chemistry

9:00 "Optimization of a Hydrogen Atmosphere Flame Ionization Detector Sensitive to Metal Compounds" by Roberts, J. E. and Hill, H. H., Washington State University.

9:25 "Equal per Carbon Atom Response of a Hydrogen Atmosphere FID" by Donovan, M. E. and Hill, H. H., Washington State University. (42)

9:50 "Emission Spectra of Solid $(nd)^6$ Complexes at Low Temperature" by Crosby, G. A. and Merrell, G. A., Washington State University. (43)

10:15 "Oxidation of Electron Rich Double Bonds" by Mott, R. C., University of Idaho. (44)

10:35 "Synthetic Studies Directed Toward Frustulosin" by Lansinger, J. M. and Ronald, R. C., Washington State University. (45)

Other Physical Science

10:55 "The Automobile's Contribution to Urban Atmospheric Halocarbon Concentrations" by Harsch, D. E. and Slater, W. R., Washington State University. (46)

11:15 "Estimates of Planar Regions of Asymtotic Stability: An Example" by Anderson, L. R., Whitman College. (47)

11:35 Lunch

March 31, 1978 Afternoon Session

1:25-4:00 Symposium: Science, Education, and Society (Todd Auditorium)

April 1, 1978 Morning Session
Presiding: Dr. A. Keith Dunker, Washington State University, Fulmer 638

8:30 "c-AMP and Membrane Potential in Saccharomyces cerevisiae and Neurospora crassa" by Trevillyan, J. and Pall, M., Washington State University. (48)

9:00 "Secretory Proteins of Sertoli Cells" by Wilson, R. M. and Griswold, M. D., Washington State University. (49)

9:20 "Oxygen Consumption and Lymphocyte Stimulation" by Ku, G. and Krakauer, H., Washington State University. (50)

9:40 "Laser Raman Studies of fd B-protein" by Williams, R. W. and Dunker, A. K., Washington State University, and Gaber, B. P. and Peticolas, W., University of Oregon. (51)

10:00 "Effects of Urea on the Electrophoretic Mobility of SDS-Protein Complexes" by Dunker, A. K. and Ackley, C., Washington State University. (52)

Physics

10:20 "Gamma-Spectroscopy with Heavy-Ion Induced Reactions" by Willmes, H., University of Idaho. (53)

10:45 "The Decomposition of Formic Acid on Ru $(10\bar{1}0)$" by Larson, L. A. and Dickinson, J. T., Washington State University. (54)

11:05 "Tribo-Stimulated Exo-Emission from Oxide Covered Aluminum" by Doering, D. L., Dickinson, J. T. and Braunlich, P. G., Washington State University. (55)

11:30 "The Scattered Spectrum of a Medium Containing Turbulent Noise" by Chao, Y. F., Baierlein, R., and McIntosh, J. S., Wesleyan University. (56)

March 31, 1978 Morning Sessions

Session 1. Presiding: D. R. Satterlund, Washington State University.

8:30 "Some contributions of conifer biome research to forestry in the Northwest" Gessel, S. P. and R. Edmonds. University of Washington. (57)

8:50 "Estimation of foliage biomass in young-growth Douglas-fir (Pseudostuga menziesii) Overton, W. S., D. P. Lavender, and D. D. McCreary. Oregon State University. (58)

9:10 "Effect of light on leaf area of Douglas-fir reproduction under managed stands in coastal Oregon" Del Rio, E. and A. B. Berg. Oregon State University. (59)

9:30 "Genetic variation in seed characteristics and height growth among open pollinated Douglas-fir families" White, T. L., K. K. Ching, and D. P. Lavender. Oregon State University. (60)

9:50 Break

10:05 "Occurrence and variation of IAA and ABA in western hemlock shoots" Nelson, E. A., J. B. Zaerr, and D. P. Lavender. Oregon State University. (61)

10:20 "Some aspects of nutrient cycling in subalpine coniferous forests" Krumlick, G. J. Canadian Forestry Service. (62)

10:40 "Relationships between site index, growth, and foliar chemical composition of western hemlock" Radwan, M. A. and D. S. Bell. U.S.D.A. Forest Service, PNW Station. (63)

11:00 "Effect of defoliation on sap velocity in grand fir" Lopushinsky, W. and G. O. Klock. U.S.D.A. Forest Service, PNW Station. (64)

11:15 "Effect of thinning on evapotranspiration of a Douglas-fir forest" Nnyamah, J. U. and T. A. Black. University of British Columbia. (65)

11:30 Forestry Section Business Meeting

11:45 Lunch

March 31, 1978 Morning Sessions

Session 2. Presiding: Dr. V. C. Baldwin, Jr., Washington State University

8:30 "Tree spatial pattern and density in some forest types of northeastern Oregon" Baldwin, V. C., Jr. Washington State University. (66)

8:45 "Dynamics of dominant trees in mixed evergreen forests of northern California" Sawyer, J. O. Humboldt State University. (67)

9:00 "Forest encroachment onto grassland range in the Chilcotin region of British Columbia" Parminter, J. V. University of British Columbia. (68)

9:30 "Regeneration of meadow-associated forest stands in central north Idaho" Larson, M. J. University of Idaho. (69)

9:45 "Investigations of fire history in the northern Rocky Mountains", Arno, S. F., USDA Forest Service. (70)

10:10 Break

10:30 "Post-fire succession in Abies grandis forests of the Swan Valley, Montana" Antos, J. A. University of Montana. (71)

10:50 "Mountain grassland and shrubland habitat types in western Montana" Stewart, W. L. Washington State University. (72)

11:10 "Predictors of annual understory production in the Abies grandis - Pachistima myrsinites habitat type" Clausnitzer, R. and B. Zamora, Washington State University. (73)

11:25 "Northwestern huckleberry management research--a fire year summary" Minore, D. U.S.D.A. Forest Service, PNW Stn. (74)

11:45 "Larch/Douglas-fir clearcutting and burning effects - a holistic research approach" DeByle, N. V. U.S.D.A. Forest Service, Intermt. Stn. (75)

March 31, 1978 Afternoon Session

Presiding: Dr. A. R. Stage. Forest Service, Forestry Sciences Laboratory, Moscow, Idaho.

Intensive Management of the Grand fir-Cedar-Hemlock Ecosystem

1:15 "Methods for predicting management effects in the grand fir-cedar-hemlock ecosystem" Stage, A. R. U.S.D.A. Forest Service, Intermt. Stn. (76)

1:35 "Predicting success of regeneration establishment" Ferguson, D. and R. J. Boyd U.S.D.A. Forest Service, Intermt. Stn. (77)

1:55 "Height growth modeling of coniferous regeneration" Foiles, M. W., D. P. Hanley and W. R. Wykoff. U.S.D.A. Forest Service, Intermt. Stn. and University of Idaho. (78)

2:15 "The effect of tussock moth defoliation on growth and development of juvenile grand fir and Douglas-fir" Moore, J. A. University of Idaho. (79)

2:35 "What is the thinning effect on diameter growth in relation to stand density?" Wykoff, W. R. and M. W. Foiles. U.S.D.A. Forest Service, Intermtn. Stn. (80)

2:55 Break

3:10 "Response of Inland Empire stands of grand fir and Douglas-fir to nitrogen fertilization" Scanlin, D. C. University of Idaho. (81)

3:30 "Crown ratio equations for 12 conifers in the northern Rocky Mountain region" Hatch, C. R. University of Idaho. (82)

3:50 "Effects of road closures on elk in northern Idaho" Irwin, L. L. University of Idaho. (83)

4:10 "Bird and small mammal profiles for managed forests in the grand fir-cedar-hemlock ecosystem" Peterson, S. U.S.D.A. Forest Service, Intermt. Stn. (84)

4:30 "Predicting the effects of forest practices on streamflow" Belt, G. H. University of Idaho. (85)

April 1, 1978 Morning Sessions

Session 1. Presiding: Dr. L. R. Askham, Washington State University.

8:00 "Recreation subdivisions on forest lands: their social and economic impacts" Askham, L. R. Washington State University. (86)

8:30 "An evaluation of the Waterton-Goat Haunt Volunteers in Parks program, summer 1977" Firman, A. S. and J. E. Hoffman, University of Idaho. (87)

8:50 "An analysis of Schweitzer Basin skiers" Tomlins, F. L. and J. E. Hoffman, University of Idaho. (88)

9:15 "Results of an attempt to control cone damage in western white pine by the mountain cone beetle through the use of the systemic insecticide Furadan" Franc, G. C. U.S.D.A. Forest Service, Clearwater National Forest. (89)

9:35 "Systematic studies of the mountain pine beetle, Dendroctonus ponderosae (Coleoptera: Scolytidae)" Stock, M. W. University of Idaho. (90)

9:50 Break

10:05 "Noble fir: reduced seed production caused by seed and cone insects" Scurlock, J., R. G. Mitchell and K. K. Ching. Oregon State University. (91)

10:20 "Origin of frost cracks in grand fir (Abies grandis (Dougl.) Lind L.) in the Blue Mountains" Aho, P. E. U.S.D.A. Forest Service, PNW Stn. (92)

10:35 "Plot spacing in systematic sampling designs" Chapman, R. C. Washington State University. (93)

10:45 "Applicability of four regional volume equations for estimating growth response to thinning Douglas-fir" Williamson, R. L. U.S.D.A. Forest Service, PNW Stn. (94)

11:00 "Tree-ring analyses help define management regimes for red alder" Smith, J. H. G. University of British Columbia. (95)

11:20 "Increment core analysis: a means of assessing response to treatment in western hemlock" Olson, J. R. University of Washington. (96)

April 1, 1978 Morning Sessions

Session 2. Presiding: D. R. Satterlund, Washington State University.

8:00 "Describing an area for designation as a natural area" Illgner, J. L. (97)
University of Montana.

8:25 "Revegetation efforts on perturbed soils near Kellogg, Idaho" (98)
Gordon, R. and J. Mitchell. University of Idaho.

8:40 "Experimental rehabilitation of cutover redwood forest land" Veirs, S. D.
USDI National Park Service, Redwood National Park. (99)

9:00 "Growth of naturally established trees on skidroad and undisturbed (100)
surfaces in the Engelmann spruce - subalpine fir zone, British Columbia"
Smith, R. B. Canadian Forestry Service.

9:25 "Field canopy effects on shoot to root ratio of western hemlock (101)
seedlings" Morris, J. W. and J. B. Zaerr. Oregon State University.

9:40 "Douglas-fir plug seedling performance as affected by dibble planting" (102)
Rischbieter, N. O. and J. R. Gutzwiler. University of Washington and
Weyerhaeuser Co.

10:00 Break

10:15 "Strategies for identifying drought resistant Douglas-fir sources" (103)
Emmingham, W. H. Willamette N.F./Oregon State University.

10:35 "An evaluation of dewatered sludge properties and their effects on (104)
coniferous seedlings" Solomonson, M. H. and R. M. Kenady University
of Washington.

10:50 "Effects of root wrenching on the stomatal control of Douglas-fir (105)
2-0 nursery stock" Duryea, M. L. Oregon State University.

11:10 "Effects of nitrogen fertilization upon the rhizosphere and growth (106)
of young-growth western hemlock (Tsuga heterophylla (Raf. Sarg.))"
Gill, R. S. and D. P. Lavender. Oregon State University.

March 31, 1978 Morning Session 9:30-Noon
Presiding: R. E. Brown, Pasco

9:40 "Some pumiceous members of tephra-set Y in Washington, Idaho and Oregon", by Smith, N.W., Okazaki, R., and Knowles, C.R., Washington State University and Idaho Bureau of Mines and Geology. (107)

10:00 "Restudy of Tertiary plant-bearing strata of the Pilot Rock area", by Elmendorf, J., and Fisk, L.H., Walla Walla College. (108)

10:20 "Paleoecology of a sedimentary interbed in the Yakima Basalt", by Barnett, J., and Fisk, L.H., Walla Walla College. (109)

10:40 "Squaw Creek-type sulfide mineralization", by Beka, F.T., Washington State University. (110)

11:00 "Effects of landslides on streams", by Savina, M.E. and Farrington, R.L., University of California. (111)

11:20 "Logging and testing of deep basalt flows in Rattlesnake Hills No. 1 exploratory well", by Eddy, P.A., Rockwell Hanford Operations. (112)

11:40 "Some observations of water witching in the Pasco Basin", by Brown, R.E., Pasco. (113)

12:00 Lunch

Afternoon Session 1:20- 5:00
Presiding: R.J. Carson, Whitman College

1:20 "Glacial deposits in the lower Skagit and Baker River Valleys, Washington, by Heller, P., Western Washington University. (114)

1:40 "Retreat of the Puget lobe of the Cordilleran ice sheet from the Olympic Pennisula, Washington", by Carson, R.J., Whitman College and Washington Division of Geology and Earth Resources. (115)

2:00 "Marine terraces and relative sea level changes, Whatcom County, Washington", by Palmer, P., Washington Division of Geology and Earth Resources. (116)

2:20 "Glacial geology along the crest of the Siskiyou Mountains centered on latitude 42° N", by Long, W. A., U.S. Forest Service. (117)

2:40 "The structural evolution of Mesozoic rocks of Southeastern San Juan Islands, Washington", by Brandon, M.T., University of Washington. (118)

3:00 "The geology of Spieden Island, San Juan County, Washington", by Johnson, S.Y., University of Washington. (119)

3:20 "Geologic contributionsto archeologic surveys-an Alaskan example from the Savage-Teklanika Rivers region, Alaska, by Thorson, R.M., University of Washington and Plaskett, D.C., University of Alaska. (120)

3:40 "Ammophila arenaria (L.) Link and the natural stabilization of coastal sand dunes", by Wiedemann, A.M., Evergreen State College. (121)

4:00 "Nocturnal air stratification in a small Scabland basin", by Quinn, R.R., Eastern Washington University. (122)

Afternoon Session 1:20- 5:00 (cont.)
Presiding: R.J. Carson, Whitman College

4:20 "Fluid inclusion thermometry, Metaline Mining District, Washington", by Wotruba, N., Washington State University. (123)

4:40 "Ancient lakes of the Columia River - Ice-dammed at high levels, by Roscoe, R. T., Seattle. (124)

March 31, 1978 Morning Session
Presiding: Dr. J. K. Garland, Washington State University

8:00 "Some Attitudes and Reactions to Declining Achievement in High-School Science" by Stronck, David R., Washington State University. (125)

8:20 "Auto-Tutorial Courses for Academically Weak Students" by Stronck, David R. and Louis D. McNew, Washington State University. (126)

8:50-10:15 Panel Discussion: "Interfacing 2-year and 4-year Schools" (127)

Moderator: J. K. Garland, Washington State University

Panelists:
Dr. Shirley Gordon, President, Highline Community College, "Community College Goals: Effort to Anticipate Transfer Situations versus Other Needs."

Dr. Frank Ligon, Director, Summer Term, Oregon State University (also OSU Representative to Oregon Committee on Articulation Between State Institutions of Higher Education), "Channels of Communication Between 2- and 4-year College Faculty."

Dr. Ron Needham, Chairman, Physical Sciences & Math, Spokane Falls Community College, "A Pragmatic Approach to Transferability; Cooperation Within Subject Areas."

Dr. John K. Garland, Coordinator of General Chemistry, Washington State University, "Discontinuities: Quarters to Semesters and Incompleted Sequences."

10:15 Coffee Break and Short Business Meeting of Section

10:30 "Six Years Experience with Innovative Learning Methods in a Univ. Genetics Course" by Becker, Walter A., Washington State University. (128)

11:10 "The Assumptions Governing the Responses of the Energy-Environment Simulator" by Stronck, David R., Washington State University. (129)

11:45 "The Energy-Environment Simulator is a Bad Model" by Tripard, G. E., Washington State University. (130)

March 31, 1978 Afternoon Session
Presiding: Dr. G. A. Crosby, Washington State University

1:30-3:50 Symposium: Science, Education, and Society (Todd Auditorium)

3:50 Coffee Break

4:00 "Outdoor Chemistry Education" by Hollingsworth, Sue, Washington State University. (201)

4:15 "The Environmental Story Box" by Meredith, Eloise and Alison Nicholson, University of Victoria. (202)

4:30 "Wilderness Travel Simulation Modeling as Aid in Education" by Mitchell, C. C. and J. H. Schomaker, University of Idaho. (203)

4:45 "The Biology of Sex Differences" by Baker, Kenneth H., Central Washington University. (204)

April 1, 1978 Morning Session
Presiding: Dr. K. D. Spitzer, Washington State University

8:10 "Current Possibilities in CAI" by Gerhold, G. A., L. Kheriaty, and M. Davidson, Western Washington University. (131)

9:00-10:45 Panel Discussion: "Using Computers and Pocket Calculators in the Mathematics Classes" (132)

Moderator: Gail Williams, Professor of Mathematics, University of Idaho

Panelists:
Dale McDonald, Teacher, Hamlin Elementary School, "The Uses of Pocket Calculators in the Elementary School."

Gene Sievertson, Teacher, Lewis & Clark High School, "The Uses of Pocket Calculators and Computers in Junior and Senior High School."

Stan Robinson, Professor of Mathematics, and Gary Breneman, Professor of Chemistry, Eastern Washington University, "The Uses of On Line Computers in the High School."

Dave Barnes, Professor of Mathematics, Washington State University, "Using the Pocket Calculator in the Calculus Classroom."

10:45 Coffee Break

11:00 "Is Preparatory Chemistry Successful?" by Henscheid, L. G. and K. D. Spitzer, Washington State University. (133)

11:15 "Taking Advantage of a Revolution: Pocket Calculators and Exam. Format" by Crosby, G. A., Washington State University. (134)

11:30 "The Science Curriculum in Early Washington State Schools" by Stradling, Dale F., Eastern Washington University. (135)

11:45 "Helping Improve Undergraduate Learning: Programs at Sixteen Universities" by Davis, John A., Washington State University. (136)

MARCH 31, 1978 MORNING SESSION

Presiding: Nancy B. Hultquist, Department of Geography, University of Idaho

8:30 OPENING REMARKS

8:40 **Relative Value of Water Related Outdoor Recreation Activities** (137)
M.L. Ripp* and J.E. Hoffman; College of Forestry, Wildlife, and Range Sciences, University of Idaho

9:00 An Empirical Analysis of Housing Preferences (138)
K.R. Tremblay, Jr., D.A. Dillman, & J.J. Dillman; Department of Rural Sociology, Washington State University

9:20 The Pre-Paradigm State of Current Electoral Theory (139)
C. Thomas Rogers; Montana College of Mineral Science & Technology

9:40 The Development of State Science Policy (140)
Fernando V. Padilla; Washington State University

10:00 FIVE MINUTE BREAK

10:05 Physiology of Political Attitude: Some Thought (141)
Muhammed A. Quddus,* Department of Political Science, University of Idaho

10:25 Types of Presbycusic Etiologies and Associated Audiometric Patterns (142)
Gail D. Chermak, Department of Speech, Washington State University

10:45 The Distinctive Acoustic Features as a Prosodic Function (143)
John B. Lord, Sr.; Department of English, Washington State University

11:05 The Development of a Comprehensive Speechreading Test (144)
M. Pat Feeney,* Gail Chermak, & Mary Ellen MacDonald; Department of Speech, Washington State University

11:25 DISCUSSION AND SELECTION OF SOCIAL SCIENCE SECTION CHAIRPERSONS FOR FUTURE MEETINGS (WESTERN WASHINGTON UNIVERSITY, 1979; UNIVERSITY OF IDAHO, 1980)

11:45 BREAK FOR LUNCH

*STUDENT

APRIL 1, 1978 MORNING SESSION

Presiding: Neil D. McFeeley, Department of Political Science, University of Idaho

9:00 The Supreme Court and the First Amendment: An Empirical Analysis (1953-76) (146)

David J. Burke; Department of Political Science, Washington State University

9:20 Bibliotherapy in Audiological Habilitation (147)

Kathleen Flemming,* and Gail Chermak, Department of Speech, Washington State University

10:00 Legal and Institutional Constraints on Geothermal Development in the Northwest (148)

David W. McClain, Oregon Institute of Technology - Geo-Heat Utilization Center, with the Idaho Office of Energy

10:20 River Recreation Use Allocation: The Basic Issue (149)

Jack Utter* and Stephen F. McCool; School of Forestry, University of Montana

10:40 Mining Law and Western Water Rights: Or How to Stake a Claim on Water (150)

Olen P. Matthews; Department of Geography, University of Idaho

11:00 Society and Technology (151)

John F. McGuire; Montana College of Mineral Science & Technology

11:20 Scientific Misinformation and Fraud in Popular Media (152)

Robert G. Schipf; University of Montana Library

11:40 INFORMAL DISCUSSION AND ADJOURNMENT

*STUDENT

March 31, 1978 Morning Session (Concurrent)
Presiding: Dr. David F. Bezdicek, Washington State University

"Soil Nutrients"

10:00 Opening of sessions

10:05 "Effects of Urea Fertilization and Refertilization on Nitrogen Fractions of A Forest Soil," by D. W. Breuer and D. W. Johnson, University of Washington. (153)

10:25 "Potential Inhibition of Nitrification in Douglas-Fir," by D. J. Vogt and R. E. Edmonds, University of Washington. (154)

10:45 Discussion

10:50 "Movement and Retention of NPK Fertilizers in Columbia River Dredge Spoil," by R. R. Kirkham and A. S. Baker, Washington State University. (155)

11:20 "Nutrient Accumulation in Basidiomycetes," by K. Vogt and R. L. Edmonds, University of Washington. (156)

11:35 Discussion

11:45 Business Meeting Soil and Water Section

March 31, 1978 Morning Session
Presiding: Dr. Donald L. Johnstone, Section Chairman, Washington State University

"Water Quality"

10:00 Opening of sessions

10:05 "Practicality of Continuous Flow Measurement of In Situ Chlorophyll A Fluorescence," by J. R. Miller and H. L. Gibbons, Washington State University. (157)

10:25 "Reservoir Temperature and Turbidity Simulations Versus Observed First-Year Water Quality Characteristics of a Major Impoundment on the Rogue River, Oregon," by D. W. Larson, Department of Biology, Portland State University. (158)

10:50 Discussion

10:55 "Phytoplankton Response to Nutrient Inactivation/Precipitation By Alum in Eutrophic Medical Lake, WA," by M. A. Beckwith and R. A. Soltero, Department of Biology, Eastern Washington University, (159)

11:15 "Response of the Zooplankton Community of Medical Lake, Washington, To An Application of Alum," by R. G. Keizur and R. A. Seltero, Department of Biology, Eastern Washington University. (160)

11:35 Discussion

11:45 Business Meeting Soil and Water Section

April 1, 1978 Morning session
Presiding: Dr. Robert Zasoski, Section Vice Chairman, University of Washington

"Watershed Processes"

8:30 "Terrestrial Stereophotography - A Valuable Illustrative Tool For Watershed Scientists and Managers," by E. P. Wosika and C. S. Yee, Humboldt State University. (161)

8:55 "Measurement of Forest Evaportranspiration With The Bowen Ratio and Eddy Correlation Methods," by D. L. Spittlehouse and T. A. Black, University of British Columbia. (162)

9:10 Discussion

9:15 "Effect of Soil Texture on Water Uptake By Douglas-Fir Seedlings," by M. G. Dosskey and T. M. Ballard, Faculty of Forestry, University of B.C., Vancouver, B.C. (163)

9:35 "Relationships Between Stand Productivity, Stand Age, Litter Decomposition and Nutrient Release in Douglas-Fir," by R. L. Edmonds, University of Washington. (164)

9:55 Discussion

10:00 Coffee Break

10:20 "Some Alpine Communities of the Kluane Range, Yukon: Biomass, Net Production Distribution," by C. C. Grier and T. M. Ballard, University of Washington and University of British Columbia. (165)

10:40 "Fine Root Dynamics in Douglas-Fir As Related To Site Index," M. R. Keyes, University of Washington. (166)

11:00 "Rock Weathering In the Central Western Cascades," by M. E. James, University of Oregon. (167)

11:15 Discussion

April 1, 1978 Morning session (Concurrent)
Presiding: Dr. Donald L. Johnstone, Section Chairman, Washington State University

"Water Quality"

8:30 "Significance of Turbidity in Water Quality," by J. M. Ebeling, Department of Agricultural Engineering, Washington State University. (168)

8:45 "The Intrusion of Fine Sediments Into A Gravel Bedded Stream," by Robert L. Beschta, School of Forestry, Oregon State University. (169)

9:10 "Stream Bedload Movement in Flynn Creek: An Undisturbed Watershed in the Oregon Coast Range," by Susan J. O'Leary, School of Forestry, Oregon State University. (170)

9:30 Discussion

9:35 "Nutrient Limitation Study of the Big Wood River In Situ Channels at Ketchum," by E. A. Merwin and W. E. Miller, Idaho USEPA, CERL. (171)

9:50 Discussion

10:00 Coffee Break

10:20 "Benthic Invertebrates, First Order Streams & Forest Harvesting Practices," by R. E. Austin, T. Shiroyama, J. C. Greene, & W. E. Miller, USEPA, CERL, Corvallis, OR. (172)

10:35 "Surface Water Quality in the Palouse Dryland Wheat Region and Preview of Current Minimum Tillage Research," by D. M. Herene, Washington State University. (173)

10:50 Discussion

April 1, 1978 Morning Session (Concurrent)
Presiding: Dr. Brent Hallock, Washington State University

"Soils"

10:55 "Raindrop Size Distribution in the Palouse," by D. K. McCool, M. J. Robinette, and Myron Molnau, USDA, Agricultural Research Service, Pullman, WA, Washington State University, University of Idaho. (174)

11:10 "Raindrop Impact and Erosion on Some Western Oregon Foothill Soils," by J. L. Young and J. King, Agricultural Research Service of USDA, and Department of Soil Science, Oregon State University. (175)

11:25 "The Effect of Drainage and Tillage on the Thermal Regime of a Bare Muck Soil in Early Spring," by M. D. Novak and T. A. Black, University of British Columbia. (176)

11:40 "Factors Effecting the Clogging of Micro-Tube Emitters in Trickle Irrigation," by D. L. Bassett and C. E. Kaiser, Washington State University. (177)

11:55 Discussion

March 31, 1978 Morning Session
Presiding: Dr. J. H. Larsen, Washington State University

8:30 "Communal night roosting of bald eagles in Western Washington" by Hansen, A. J., Huxley College of Environmental Studies. (178)

8:55 "Stimuli eliciting and orienting parental protective behavior in gulls" by Conover, M. R. and D. E. Miller, Washington State University. (179)

9:20 "A north-south flyway for eastern North American birds through the Idaho-Washington-Oregon border area" by Larrison, E. J., University of Idaho. (180)

9:50 "Nesting success of the Canada Goose in the Hanford site" by Richard, W. H., R. E. Fitzner, and R. H. Sauer, Battelle, Pacific Northwest Laboratory. (181)

10:10 Break

10:30 "Niche separation in five species of small flycatchers" by Frakes, R. A., Washington State University. (182)

10:50 "Social impacts from wildlife in the Columbia Basin project" by Rajala, J. A. and R. L. Shew, Washington State University. (183)

11:10 "Mammals of the Nooksack Cirque" by Weisbrod, A. R., and J. A. Dragavon, University of Washington. (184)

11:35 Lunch

Presiding: Dr. P. C. Schroeder, Washington State University

8:30 "Control of Larch casebearer populations by density-dependent parasitism" by Long, G. E., Washington State University. (185)

8:45 "Codling moth egg distribution and first-instar survival in an abandoned orchard near Pullman, Washington" by Jackson, D. M., Washington State University. (186)

9:00 "Courtship behaviors of the codling moth, Laspeyresia pomonella L., in the laboratory" Castrovillo, P. J., University of Idaho. (187)

9:20 "Deterrency of a generalist herbivore (Malacosoma pluviale californicum) by Alnus rubra resin" by Adams, A. B., D. F. Rhoades, B. R. Vogel, and L. M. Erckmann, University of Washington. (188)

9:40 "Migration routes of Northwest earthworms (Oligachaeta: Megascolecidae)" by Fender, W. M., Oregon State University. (189)

10:00 Break

10:20 "A comparative study of temperature tolerance and acclimation in temperature and tropical intertidal snails" by Moore, A. K., and M. Plunkett, Seattle Pacific University. (190)

10:40 "Osmotic stress tolerances of two tropical intertidal snails: Littorina pintado and Nerita picea" by Moore, A. K. and N. Ludeman, Seattle Pacific University. (191)

10:55 "Characteristics and site of habituation of central neurons mediating tentacle retracton in the land slug Ariolimax" by Chan, C. Y., Washington State Univeristy. (192)

11:20 "The development of somatic polyploidy in a Marine Isopod" by Matlock, D. B., Central Oregon Community College. (193)

11:45 Lunch

Afternoon Session
Presiding: Dr. J. H. Larsen, Washington State University

1:00 "Age and growth aspects of the rainbow trout found in Pend Oreille Lake, Idaho" by Anderson, B. D., Washington Water Power Company. (194)

1:25 "Coiling and feeding behavior in wandering garter snakes (Thamnophis elegans vagrans)" by Peterson, C. R., Washington State University. (195)

1:45 "The niches of two sympatric turtles, Trionyx muticus and Trionyx spiniferus in Iowa" by Williams, T. A., Washington State University. (196)

2:05 "K^+ fluxes in marine fish by Sanders, M. J., Washington State University. (197)

2:25 "Adipose tissue relationships in the domestic chicken" by Becker, W. A., J. V. Spencer, L. W. Mirosh, and J. A. Verstrate, Washington State University. (198)

2:45 Business Meeting/Break

3:15 "Urea metabolism and protein sparing in Citellus lateralis" by Moore, A. K., and N. Boe, Seattle Pacific University. (199)

3:35 "The effect of para-chlorophenylalanine on behavioral thermoregulation in the gerbil" by Winston, M. L. and J. L. Hanegan, Eastern Washington University. (200)

4:00 End

1

Goldstein, G. H. & R. del Moral. MULTIVARIATE ANALYSES OF COMMUNITY PATTERNS IN TWO DISJUNCT AMPHITROPICAL DESERTS. Dept. Botany, Univ. Washington.

One of the projects of the International Biological Program tested the hypothesis that given two regions with identical climates, geology, and topography and sufficient time for natural selection to occur, ecosystems that are identical in structure and function will result despite differences in the initial floras and faunas. This paper explores the degree to which plant community patterns converge along analogous gradients in the disjunct warm deserts of South and North America. Several multivariate continuous techniques were used to test for the existence of similar strategies and community patterns in these systems. Convergence in patterns of richness and diversity are only moderate.

2

Baldwin, Jr., V.C. Variations in pattern and density estimates using point to nth nearest individual or nth nearest neighbor distance measures in k sectors. Washington State University.

Two dimensional random, uniform and clumped point populations were generated on a computer. Pattern and density sampling experiments were then performed on each population using numerous random point to nth nearest individual and random individual to nth nearest neighbor, in k sectors, distance measure indices. The accuracy of pattern or density estimation was noticeably affected by the size of n and k. It is shown that measurement to the nth nearest individual in each of k sectors about a randomly selected point or individual, for large k and/or n, is disadvantageous to the detection of pattern. Conversely, it is advantageous in estimating density, but not enough to justify general use of distance measure techniques for estimation of density in nonrandom populations.

3

Folsom, M. M. LINEAR VEGETATION PATTERNS ASSOCIATED WITH BEDROCK JOINTS IN PINE WOODLANDS OF EASTERN WASHINGTON. Eastern Washington University.

Vegetation stands in the Ponderosa pine woodland of southern Spokane County in Eastern Washington show distinct linear arrangements. The linearities are coincident with joint and fracture patterns in the underlying basalt rock. The joints and fractures promote deeper soil development and greater water-holding capacity, which, coupled with capillary water rising from shallow perched water tables, allow superior seedling survival, more rapid growth, and better drought survival of individual plants. These vegetation patterns aid understanding of pine stand regeneration, can be used to aid mapping of geological structures, and may provide clues to the origin of the silty "Scablands Mounds."

4

Adams, A.B., C.D. Oliver, and R. del Moral Classification and Dynamics of the Vegetation of the Nooksack Canyon, North Cascades National Park. University of Washington.

An agglomerative clustering technique was used to analyze the vegetation of the North Fork of the Nooksack River between its headwaters and junction with Price Creek. The resultant classification was used to construct a vegetation map. Many of the communities occur as discrete entities (patches) that are homogeneous in physical structure, species composition and species number with their boundaries being set by the interrelationship between age, topography and natural disturbances. Heterogeneity among patches changed as a function of age since glaciation. In this region models which incorporate multiple stable points in space and time are believed to be more applicable than models based on assumptions of global stability.

5

Black, R. Alan. Simulation modelling of black spruce reproduction near treeline. University of Calgary, Calgary, Alberta.

An empirically derived stand reproduction model of subarctic black spruce (Picea mariana) was constructed using a discrete event formalism and, as driving variables, degree days and mean return interval of wildfire. Simulated results show burn interval did not affect reproduction in stands 100-225 years-old. However reproduction was reduced with longer or shorter burn intervals and simulated stand reproduction was prevented by 20-40 year burn intervals. Seed germination was the ultimate control of simulated treeline and seed production probably controlled simulated forestline (limit of closed forest). In addition, simulation results suggested major movements of treeline may have occurred as a consequence of short term or local climatic change operating on a limited time period for successful reestablishment after stand destruction.

6

Hironaka, M. A conceptual model of secondary succession.
College of Forestry, Wildlife & Range Science
University of Idaho, Moscow, Idaho 83843

A conceptual model of secondary succession is multidimensional and is viewed as a solid cone. The cone includes all of the potential seral communities within a habitat type. The apex of the cone represents the climax community type. Community types at the base are those with vegetation least similiar to the climax community type. A potentially larger number of community types exists as disturbance stress is increased. As secondary succession leads back to climax, the number of community types is reduced as the communities converge and become more similiar to the climax community.

Only the climax community type is unique to a habitat type, whereas the same seral community type may occur in more than one habitat type.

7

Slocum, C.J., and R. del Moral
WHY ARE ALGAE SHAPED THAT WAY? FORM, PHYSIOLOGY AND PREDATION
Department of Botany, University of Washington

The intertidal red alga Gigartina subgenus Mastocarpus has two life-forms in its cycle(West 1972)-- it alternates between an upright blade (Gigartina) and a fleshy crust(Petrocelis). The evolutionary significance of such alternation of heteromorphic generations is little understood. I carried out field experiments to test differences in the "strategies" of the two phases, centering on 1)physical factors, such as intertidal position, and 2)biological factors, such as interactions with grazers. These experiments included transects and herbivore removals, over a period of 1.5 years. Differences in the two forms were characterized in several ways: transect position, and changes in both numbers of plants, and growth rate in the control and herbivore-exclusion treatments.

8

R. W. Kiser PHENOLOGY OF THE TREES, SHRUBS AND FORBS IN A SECOND GROWTH FORESTED AREA OF WESTERN WASHINGTON.
Centralia College (Ret.)

A study of a second growth Douglas fir forest was initiated in 1975 and continued through 1977. The phenology of the trees, shrubs and forbs was noted. Bi-monthly visits were made to the area. The study area, known locally, as Seminary Hill is east of and adjacent to the city of Centralia, Washington. It comprises an area of approximately 80 acres (32.4 hectares) and is 400 feet (122 meters) elevation above sea level. A total of 216 species have been identified but only 100 persistent species were selected for this study.

9

Gill, Steven J. TAXONOMIC VALUE OF STOMATAL TYPES IN SELECTED UMBELLIFERAE GENERA
Department of Botany, Washington State University

The taxonomic value of stomatal types in selected Umbelliferae genera, including Lomatium and Tauschia were evaluated. Material obtained from herbarium specimens was cleared with lactic acid. The temporary mounts were photographed to compile a permanent record of stomatal types. The acetone plastic cover slip method was attempted, but found to be generally unsatisfactory. These data from Pacific Northwest species were compared with published results of European studies.

10

Jewell, James E.
A BIOSYSTEMATIC STUDY OF CAMASSIA CUSICKII WATS. AND ITS ALLIES (LILIACEAE)
University of Idaho

There have been no studies of Camassia cusickii Wats. other than the classification by Sereno Watson in 1887 and the monograph of the genus by Frank Gould in 1942. This project which was undertaken to complement these earlies works compared C. Cusickii and its neighbor Camassia quamash (Pursh) Green by means of field studies of soil, habitat, and ecological preferences; common garden studies including crossing attempts, gross morphology; paper chromatography of the flavenoids, scanning electron microscopy of pollen and leaf surfaces, and cytology. These studies fully supported the earlier works in upholding the specific status of C. cusickii.

11

Brunsfeld, Steven J. ALPINE FLORA OF EAST-CENTRAL IDAHO
University of Idaho

During the summers of 1976 and 1977 field investigations were completed for an alpine flora of the Lost River, southern Lemhi, and southern Beaverhead ranges of east-central Idaho. These mountains contain a large percentage of the states' alpine vegetation. Many species (e.g. Kelseya uniflora, Primula parryi) appear to be restricted to particular rock types within the study area. New populations of a number of rare plants (e.g. Draba oreibata) have been found, as well as several probable state records and range extensions (e.g. Saxifraga deblis). Major alpine vegetation types in the area, as well as the world-wide distribution patterns of Idaho's alpine flora have been investigated.

12

Anderson, E.F., Dorsett, C.S., and Fleming, E.O.
THE AIR-BORNE POLLENS OF WALLA WALLA, WASHINGTON
Whitman College

Air-borne pollens were collected and identified in and around Walla Walla during the pollen seasons of 1975 and 1976. From the 821 samples taken during the two 35-week periods a total of 51 genera in 22 families were identified. A pollen season chart was constructed to assist local physicians who are treating patients with pollen allergies. This was the first extensive study of air-borne pollens made in the southern Palouse Prairie region of the Pacific Northwest.

13

Besand, D. L. WHO CARES ABOUT SEX, A Computer-generated Vegetative Key to the Grasses
Marion Ownbey Herbarium, Washington State University

The generation, practibility and flexibility of a computer-generated vegetative key to the grasses is discussed. Field identification of grasses in the vegetative stage facilitates determination of range carrying capacity and productivity of given grass species. Through the use of a computer program, a number of vegetative keys were developed for the Shoshone BLM Grazing District in South Central Idaho. Work has shown that usable vegetative keys can be constructed more easily than is possible without computers.

14

Bobisud, H. M. A STUDY OF TWO CHIMERAL VARIETIES OF Sansevieria trifasciata
University of Idaho

Sansevieria trifasciata var. laurentii has been found to be a 4-2-2 cytochimera as well as a YGG chlorophyll chimera. A new variety arising on laurentii is a GYG chlorophyll chimera but the yellow tissue is diploid and has other characteristics different from the yellow tissue of laurentii. Ultrastructural studies of chloroplasts from the two types of yellow tissue are in progress.

15

Adams, Virginia D. Coevolution of Six Species of Pedicularis and their Bombus Pollinators. University of Washington

Optimal foraging theory has successfully predicted the optimal diet, patch type, allocation of time and movement patterns of animal species. A similar optimal attraction theory can be applied to plants since they should maximize pollen transferred to a conspecific individual. Plant characteristics that could coevolve to maximize seed set are numbers of flowers per plant, temporal and spatial distributions of the flowers, the reward amount and location, and the attraction image (e.g. color, scent, and special morphologies). This study is an attempt to develop such a theory. Aspects of this model will be discussed with respect to field studies in Mount Rainier National Park on six species of Pedicularis which are pollinated by Bombus.

16

Kennison, J.A. and R.J. Taylor. SPECIES QUESTION CONCERNING TARAXACUM OFFICINALE and T. LAEVIGATUM.
Western Washington University, Bellingham, WA 98225

Considerable ambiguity exists concerning the species distinction between Taraxacum officinale and T. laevigatum. In this study samples were systematically collected from populations ranging from the San Juan Islands to the Eastern Cascades and transplanted to a greenhouse. Variability within and between the two species was determined by morphological and chemical parameters and the data were statistically analyzed. The preliminary results indicate minor variation which does not warrant separation of the species.

17

Bookman, P.A. Variation in Populations of Bromus tectorum L. in eastern Washington
Washington State University

Variation was measured in samples of four populations of Bromus tectorum L. from eastern Washington. Estimates of within taxa variation were made and comparisons between taxa using the coefficient of phenetic variation (CV) indicate little variation within populations but a large intraspecific variability. A large number of characters for few operational taxonomic units (OTU) yield phenetic distances between OTU's. By using only floral and then only floral and vegetative characters a second estimate of overall variation was obtained. Calculated summary statistics differ using the two sets of characters. The minimal number of OTU's needed for replicable results is ten. Results are compared to those obtained by samples from other families.

18

Barker, L. M. A FLORISTIC STUDY IN NORTHERN DEL NORTE COUNTY, CALIFORNIA.
Humboldt State University, Arcata, Calif.

A floristic inventory of the Old Gasquet Toll Road, northeast of Gasquet, California, has yielded a list of 67 families, 236 genera, and 401 species of vascular plants. The study area encompasses both ultrabasic and metavolcanic parent materials of considerable age and supports an array of plant communities. Mixed evergreen forest is dominant on metavolcanics, while montane chaparral and mixed pine woodlands variously dominated by Pinus monticola, P. jeffreyii, P. contorta and P. attenuata occur on ultrabasics. The species list contains plants endemic to the Klamath Region and to ultrabasic soils and bogs. Taxonomic problems exist among several taxa and range extensions are numerous in this previously relatively unstudied area.

19

Jacobsen, T. D. Counts of Vascular Bundles in the Genus Allium. Washington State University.

Variation in the numbers of vascular bundles of 11 species forming the Allium cernuum, the Allium validum and the Allium kunthii alliances was observed. The number of vascular bundles has proven diagnostically useful in two of the alliances. The mean number of vascular bundles helps distinguish the Allium cernuum and the Allium validum alliances. The vascular bundle number for the Allium kunthii alliance is so variable that this character is of little taxonomic value for this alliance.

20

Mastrogiuseppe, R. J., and J. D. Mastrogiuseppe. HYBRIDIZATION IN FOXTAIL AND BRISTLECONE PINES. College of Forestry, University of Idaho, and Marion Ownbey Herbarium, Washington State University.

A hybridization experiment was begun during the 1976 field season to test crossability between taxa of Pinus subsection Balfourianae. Twelve northern-population P. balfouriana (foxtail pine) were selected as mother trees, in a native stand at Lake Mtn., NW California. Previous studies have used only southern-population P. balfouriana as mother trees. Pollen sources were Colorado P. aristata (bristlecone pine), Nevada P. longaeva (Great Basin bristlecone pine), S. Sierra Nevada P. balfouriana, and local Lake Mtn. P. balfouriana. Of 45 conelets pollinated in 1976, 21 aborted, and 24 seed cones were harvested in autumn, 1977. The combination of P. aristata and P. balfouriana was previously untried. 55% of the conelets pollinated with P. aristata pollen developed into mature cones. Seeds are being X-rayed to determine percentage of filled seeds. Germination of these in Petri dishes will precede nursery planting.

21

Lewis, G.M. THE ECOLOGY OF THE GRASSLANDS OF THE CYPRESS HILLS PROVINCIAL PARK, ALBERTA, AND THE EFFECTS OF GRAZING. The University of Calgary.

The interaction of soils, climate and topography in the Cypress Hills Provincial Park, Alberta, result in an island of *Festuca scabrella* grassland on a high plateau (550 M) above the surrounding plains. Twenty-four grassland stands were sampled and ordinated using the Bray-Curtis technique. *Festuca scabrella-Danthonia intermedia*, *Festuca scabrella-Danthonia parryi*, and *Stipa comata-Koleria cristata* communities were identified and described. Environmental factors, previous land-use and grazing effects were evaluated in terms of productivity and species composition. Presently, no management plans have been developed for the Park grasslands, but the need for such will be discussed.

22

Belsky, Joy. COMPETITION BETWEEN TWO SPECIES OF ALPINE FESCUE. University of Washington

Festuca idahoensis and F. ovina grow sympatrically in dry alpine meadows of the Olympic Mountains. Only F. idahoensis occurs in the more mesic meadows. Three hypotheses were tested in the greenhouse and in the field to determine why F. ovina was absent in the mesic habitats: (1)competitive exclusion by the more vigorous plants at various life stages, (2)inappropriate moisture conditions or mineral nutrients, and (3)lack of factors necessary for the completion of F. ovina's life cycle. The studies indicate that although F. ovina can grow and reproduce in mesic meadows, the seedlings grow too slowly to compete for light in the densely vegetated sites.

23

Jackson, L.E. Life Cycles of Herbaceous Plants in Two Western Washington Meadow Communities. University of Washington.

The timing and duration of vegetative growth, flower bud initiation, blooming and seed set in meadow plants were documented from low and high elevation communities. Long periods of pre-reproductive growth, wider staggering of blooming between species, showy large flowers and specialist insect pollinators were characteristic of the lowland prairie grassland. In the sub-alpine meadow, fewer plants reproduced, but blooming periods were long with less staggering between species, inflorescences were compact heads of small flowers, and most pollinators were generalists. Analysis of species and community growth patterns was correlated with seasonal climatic features at each field site.

24

Winner, W.E.[1], Bewley, J.D.[1] and Krouse, H.R.[2]. The use of stable sulfur isotopes to monitor the accumulation of SO_2 pollution in terrestrial plants, duff and soils

Biology[1] and Physics[2] Departments, Univ. of Calgary

^{34}S abundance was analyzed for plant materials and soils collected from 1) potted plants transferred near to an SO_2 emission source and 2) an SO_2 stress gradient. $\delta^{34}S$ values were higher in terrestrial mosses than in conifer needles. The absolute values reflect the degree to which specimens have been stressed. Moss carpets and duff layers appear to serve as a sink thereby delaying the rate at which soils and needles accumulate SO_2. Therefore, analysis of $\delta^{34}S$ values can help define SO_2 dispersion patterns, the rates at which ecosystem components accumulate this pollutant, and more closely associate suspected SO_2 injury to an emission source.

25

Basabe, F.A. and R.J. Taylor. FLUORIDE INJURY TO DOUGLAS FIR IN NORTHWEST WHATCOM COUNTY, WASHINGTON. Western Washington University, Bellingham, WA 98225

Fluoride injury to vegetation in northwest Whatcom County has become apparent during the past several years, a period correlating with the operation of an aluminum reduction plant. In this study douglas fir was chosen as an indicator of pollution effect because of its sensitivity to atmospheric fluorides. Trees were systematically selected within a 10 mile radius of the Intalco Aluminum plant, corings were made, and 1, 2, 3, and 4 year old needles were collected for fluoride analyses. Correlations were then made among fluoride concentrations in needles, visible fluoride symptoms, climatic factors, and growth increments of trees. The impact of the aluminum reduction plant is reflected by analysis of annual growth rings.

26

Taylor, R.J. SULFUR DIOXIDE EFFECT IN NORTHWESTERN WHATCOM COUNTY, WASHINGTON. Western Washington University, Bellingham, Washington 98225

A combined field-laboratory study was conducted during the period 1966-1976 in the vicinity of Mobil and ARCO oil refineries near Ferndale, Washington. The study was designed to monitor the effect of sulfur dioxide on native and cultivated plants within the industrial area, and consisted of critical field observations, productivity analyses, plant community analyses, and sulfur determination of leaf tissue and soil samples. The effects of SO_2 emission appeared to be neglible except in regard to lichens and bryophytes which were severly injured in critical sites. Synergism between hydrogen fluoride and sulfur dioxide is suggested as an explanation for SO_2 injury at less than "injury threshold" concentrations.

27

Metting, B. Algal Community Dynamics in an eastern Washington Silt Loam. Washington State University

Fluctuations in diversity and numbers of algae in cultivated and uncultivated portions of a single soil unit were monitored in 1977. Differences between the two communities were related to micro-environmental properties as influenced by climate and farming practices.

28

Stocker, R.K. VEGETATION AND POWER PEAKING ON THE COLUMBIA RIVER. Washington State Department of Game. The Dalles, OR

The proposed increases in river fluctuation, both amplitude and frequency, to accomodate increased demands for hydro-power, are expected to directly affect the species composition and/or survival of riparian communities, most of which are newly developed since inundation.

A baseline inventory of Columbia River riparian plant and animal communities has been made and now comparisons (paired-site) are being made between sites exposed to normal river fluctuation and neighboring sites with fluctuations reduced by impoundment to investigate the expected effects of increased fluctuation. Additional studies are being made of plant distribution in relation to water levels (upslope distribution). The results of one year's effort in these two types of study will be reported.

29

Stekel, Peter. GEOGRAPHICAL VARIATION IN THE MORPHOLOGY OF *Picea sitchensis* IN CALIF. Humboldt State University.

Previous studies with *Picea sitchensis* in its continuous range have indicated a clinal distribution of certain morphological characters. A disjunct population in Fort Bragg, California, has never been studied. It would be expected to be morphologically distinct based upon present geography; however, characters show clinal relationships with other California populations to the north indicating only recent disjunction.

30

Cope, E.A. Terpene analysis of *Abies lasiocarpa* in California and Oregon. Humboldt State University.

Abies lasiocarpa occurs in only two known stands in the Klamath Mountains of northern California. This and other northern species, such as *Picea engelmannii*, *Abies amabilis* and *Chamaecyparis nootkatensis* are considered relics of either late Tertiary or Pleistocene introduction. Terpene composition is regarded as an important diagnostic character in *Abies*. Comparison of terpenes in California trees with Oregon main range populations suggests more recent introduction of *Abies lasiocarpa*.

31

Jackson, P. A. and G. G. Spomer. ECOLOGIC IMPLICATIONS OF CONIFER TISSUE WATER PARAMETERS. Dept. of Biol. Univ. of Idaho, Moscow, ID. 83843

Values for tissue water parameters of Pinus ponderosa, Pseudotsuga menziesii, Abies grandis, and Thuja plicata were derived from relations between relative water content and corresponding water-potential level. This relation changed progressively over the growing season but was generally distinct for each species. Differences in parameter values between species, especially proportion of apoplastic water and osmotic potential at incipient plasmolysis, might explain in part species distributions with respect to moisture and heat. Results suggest that Pseudotsuga can tolerate the lowest internal water-potentials, while minimum water-potentials tolerated increase in Pinus, Abies, and Thuja, respectively.

32

Blanchette, R. A. and C. G. Shaw. ACCELERATING DECAY OF FOREST RESIDUES-TECHNIQUES FOR EVALUATION. Dept. of Plant Pathology, Wash. State Univ., Pullman, WA.

Forest residues resulting from logging and thinning operations can be rapidly decomposed by inoculating with select groups of wood inhabiting microorganisms. Field experiments have been evaluated for chemical (glucosamine assay), physical (compression tests), and morphological (scanning electron microscopy) changes taking place during the decay process of coniferous wood. Significant (2-7 fold) increases in decay were observed when chip piles were inoculated with white-rot (Polyporus versicolor, P. abietinus) or brown-rot (Poria placenta) fungi along with bacteria (nitrogen-fixing Enterobacter spp.) and yeasts (Saccharomyces bailii var bailii and Pichia pinus) as compared with chips inoculated with a basidiomycete alone or control (no treatment) chips.

33

Harrington, T. C., R. A. Blanchette, and C. G. Shaw. IN VITRO BASIDIOSPORE AND CHLAMYDOSPORE PRODUCTION IN CRYPTOPORUS VOLVATUS. Dept. of Plant Pathology, Wash. State Univ., Pullman, WA

Cryptoporus (Polyporus) volvatus is a widespread fungus which decays sapwood of coniferous trees. Isolates of the fungus from three locations were shown to produce basidiospores and chlamydospores when cultured on malt extract agar. Although these structures are unreported in the literature, they consistently occur in these isolates. The physical requirements for basidiospore production were investigated and the morphological characteristics of aberrant (in vitro) fruiting bodies compared with sporophores produced in nature using scanning electron microscopy. Chlamydospores occur as terminal and intercalary swellings of desiccated hyphae. Also, chlamydospores were found in the insect galleries of Dendroctonus pseudotsugae and may play a role in dissemination of this fungus by bark beetles.

34

Hunt, G. A. Fungal Sporocarp Phenology in an Oregon Coast Range Douglas-fir Forest
Oregon State University

Mushrooms were collected from permanent plots located in the Coast Range of Oregon during weekly sampling from October 1976 to January 1978. Data will be presented on numbers and biomass production by mycorrhizal and nonmycorrhizal species as related to temperature and precipitation.

35

Holsinger, K. E. THE ROLE OF SELENIUM IN THE EVOLUTION OF ALLIUM AASAE OWNBEY. College of Idaho.

The distribution of Allium simillimum Hend. suggests that during the last Ice Age it may have spread across the Snake River Plain leaving behind remnant populations when the climate dried. As the well-adapted Allium acuminatum Hook. reinvaded the desert area these remnants were restricted to areas where A. acuminatum could not grow. These were apparently the highly seleniferous soils of the foothills near Boise and the remnants became Allium aaseae Ownbey.

36

Naskali, R. J. INTERNODE ELONGATION IN MONOCOTYLEDONS.
Dept. of Biological Sciences, Univ. Idaho

During vegetative growth, internodes in Iris, Amaryllis, Crinum, Sprekelia, Aloe, Gasteria, Habranthus, Eremurus, Narcissus, and Zephyranthes remain congested. In each of these genera, peduncles elongate greatly prior to flowering, resulting in long scapes or bracted peduncles. In some of these genera, peduncle elongation is in an isolated and basal intercalary meristem(e.g.,Narcissus). In others, most elongation occurs in the apical-most part of the peduncle as an uninterrupted meristem contiguous with the apical meristem. In the Amaryllidaceae, various combinations of these two modes of elongation occur.

37

Spomer, G. G. and K. A. Laurence. ANTIBODY INHIBITION OF ABSCISIC ACID IN STOMATES. Dept. of Biol., Univ. of Idaho, Moscow, ID. 83843.

Antibody serum for abscisic acid (ABA) was developed by injecting ABA-bovine serum albumin conjugate emulsified in Freund's adjuvant into rabbits. Antiserum specificity for ABA was subsequently indicated by hemagglutination. Stomates exposed to low CO_2 levels in light were significantly more open when treated with ABA solution mixed with antiserum than when treated with equivalent concentrations of ABA alone. Stomates incubated in antiserum and then exposed to high CO_2 levels in light were significantly more open compared with controls in distilled water or "normal" serum. These results suggest that antibodies may be used as specific inhibitors of both exogenous and endogenous plant hormones.

38

Roberts, L. W., Laurence, K.A. & Johnson, D.J. Univ. Idaho. INHIBITION OF THE CYTODIFFERENTIATION OF TRACHEARY ELEMENTS IN VITRO BY A KINETIN ANTIBODY.

The hormonal requirements for the initiation of tracheary element differentiation in cultured explants of parenchymatous tissue includes exogenous auxin and cytokinin. Kinetin was conjugated to bovine serum albumin, and a preparation of the conjugate was periodically injected into rabbits. Subsequently antibody reactions were exhibited by agar gel diffusion, immunoelectrophoresis and tanned cell hemagglutination techniques. The differentiation of tracheary elements in cultured explants of pith tissue excised from heads of Romaine lettuce was blocked, to a considerable extent, by the incorporation of the anti-cytokinin antibodies in the culture medium.

39

Kupferman, E. M. and W. H. Loescher. GROWTH AND DEVELOPMENT OF PEACH MESOCARP TISSUE IN VITRO. Department of Horticulture, Washington State University, Pullman, WA 99164

The development of peach fruits follows a definite sequence of changes which could be a result of changes in tissue sensitivity to a constant level of growth hormones, or to changing hormone levels. In order to study these alternative mechanisms, peach (var. Redhaven) mesocarp tissues from growing fruits at various stages of development were excised and grown on media supplemented with several levels of either an auxin, a gibberellin, a cytokinin or ethylene. Subsequent growth in vitro was compared at 15-day intervals. Growth, as measured by changes in fresh weight, was promoted by either gibberellin or cytokinin. Auxin, however, was inhibitory, regardless of the maturity of the fruit from which the explant was taken. Color development in vitro, as a sign of maturity, proved to be a result of the same anthocyanin as formed in vivo.

40

Negm, F. B. and W. H. Loescher. ISOLATION OF SORBITOL DEHYDROGENASE FROM PLANT TISSUE. Department of Horticulture, Washington State University, Pullman, WA 99164

In apples and many other species in the Rosaceae, sorbitol is the predominant form in which photosynthate is translocated from leaves to the rest of the plant. Metabolism of sorbitol is poorly understood. We have detected and isolated for the first time sorbitol dehydrogenase from plant tissue. The enzyme catalyzes the oxidation of sorbitol, xylitol, L-arabitol, ribitol, and L-threitol. The following are not oxidized: D-mannitol, galactitol, D-arabitol and erythritol. The enzyme is specific for NAD.

41

Roberts, J. E. OPTIMIZATION OF A HYDROGEN ATMOSPHERE FLAME IONIZATION DETECTOR SENSITIVE TO METAL COMPOUNDS Washington State University.

A detector has been developed that is highly sensitive and selective for metal compounds eluted fron a Gas Chromatoghaph (Hill & Aue, J Chromatogr., 122(1976)515). Best response is less than 10^{-12}gm. for a compound of aluminum with a selectivity greater than 10^5 over non-metal compounds. The detector responds to many metals such as tin, lead, chromium, and iron, and is particularly well suited for the analysis of alkyl lead in gasoline.

Detector construction is simple. Modification of a standard FID is possible. Construction details and optimization of gas flows will be discussed.

42

Donovan, M.E. and Hill, H.H. EQUAL PER CARBON ATOM RESPONSE OF A HYDROGEN ATMOSPHERE FID, Washington State University.

Conventional flame ionization detectors for gas chromatography exhibit an equal per carbon atom response (i.e., the response per mole of compound is relative to the number of carbon atoms in the compound). In this study, the equal per carbon atom response phenomenon was demonstrated for a novel flame ionization detection technique in which the response of metal compounds is enhanced over that of compounds not containing metals. These results indicate that the mechanism of hydrocarbon ionization in the two flame systems may be similar.

43

Crosby, G. A. and Merrell, G. A. EMISSION SPECTRA OF SOLID $(nd)^6$ COMPLEXES AT LOW TEMPERATURE Washington State University

Photoluminescence spectra of complexes of the type M_2PtX_6(M=K,Rb,Cs; X=Cl,Br) at low temperature consist of broad band envelopes at 77°K characteristic of ligand-field transitions. The spectra display well-resolved fine structure at very low temperatures (<4°K) that is, in some cases, amenable to Franck-Condon analysis. Both the positions of the band maxima and the vibrational structure are cation dependent. A variety of physical measurements on these and related $(nd)^6$ complexes has yielded quantitative information on the nature of the excited (emitting) states, the relaxation rates, and the factors that affect the geometrical distortion that occurs upon excitation.

44

Oxidation of Electron Rich Double Bonds

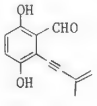
R. C. Mott, Grad. Student, University of Idaho

The oxidation of cyclic trimethylsilyl enol ethers with Lead (IV) carboxylates has been shown to be a high yield reaction. The mechanism of oxidation will be discussed with regards to the influences of ring size and the nature of the carboxylate. Comparison will also be drawn to the oxidation of trimethylsilyl enol ethers with mercury (II) acetate and silver iodo dicarboxylates.

45

SYNTHETIC STUDIES DIRECTED TOWARD FRUSTULOSIN
J. M. Lansinger and R. C. Ronald
Chemistry Department, Washington State University

An approach to the total synthesis of frustulosin I, a novel acetylenic, antibiotic metabolite of Stereum frustulosum, will be described. A novel trans metalation reaction is employed to obtain a 1,2,3,4-tetrasubstituted aromatic precursor from readily available starting materials, and which is further elaborated by a palladium catalyzed coupling reaction to form the basic carbon skeleton of frustulosin. The use of boron triiodide as a selective ether cleavage reagent will also be discussed.



1

46

Harsch, D. E. and W. R. Slater, THE AUTOMOBILE'S CONTRIBUTION TO URBAN ATMOSPHERIC HALOCARBON CONCENTRATIONS.
Washington State University

Urban ambient air samples taken in Pullman, WA, during periods of peak traffic were found to contain elevated concentration levels of certain halocarbon species including CH_3Br and $CHCl_3$. Exhaust gases from an automobile burning conventional "leaded" gasoline contained significant concentrations of these species, while exhaust gases from an automobile burning "non-leaded" gasoline and equipped with a catalytic converter contained only slightly greater than ambient levels of CH_3Br and $CHCl_3$. An expanded study involving the sampling of exhaust gases from a wide variety of gasoline engines, and sampling of urban air in Spokane, WA, under various meteorological conditions has been undertaken. Preliminary results of this study are reported.

47

Anderson, L.R. ESTIMATES OF PLANAR REGIONS OF ASYMTOTIC STABILITY: AN EXAMPLE. Whitman College

In an earlier paper, the current author and Walter Leighton gave a class C of functions that served as Liapunov Functions for certain autonomous systems of second order. Each member of the class is a function V dependent on a weight function θ. An unsolved problem is the problem of selecting a weight function θ so that the estimate of the extent of asymptotic stability given by V_θ somehow maximizes estimates over the class C.

In this discussion we consider the Van der Pol Equation and show that over a sublcass of C one can in a certain sense maximize the estimates of the region of asymptotic stability. In so doing, we find a closed form estimate for the diameter of the unique limit cycle of the Van der Pol Equation. This estimate improves a well-known estimate given by J. P. LaSalle.

48

Trevillyan, J., M. Pall. c-AMP AND MEMBRANE POTENTIAL IN SACCHAROMYCES CEREVISIAE AND NEUROSPORA CRASSA. Washington State Univ.

Diverse treatments which are known to depolarize the plasma membrane in N. crassa lead to a rapid transient increase in endogenous c-AMP levels. These treatments include transport fluxes, rapid temperature shifts, mechanical stress, the polyene antibiotic nystatin, the cyclic polypeptide antibiotic tyrocidine, and the uncoupling agents 2,4 dinitrophenol and CCCP. The maximal increases in the intracellular concentration of c-AMP follow the depolarization of the plasma membrane and precede the maximal recovery of the membrane potential. We propose that c-AMP acts via a homeostatic control mechanism to maintain the plasma membrane potential and integrity. Nystatin, 2,4 dinitrophenol and CCCP elicit a similar c-AMP response in S. cerevisiae, thus this may be a general function of c-AMP in lower eukaryotes.

49

Wilson, R. M. and Griswold, M. D. SECRETORY PROTEINS OF SERTOLI CELLS. Washington State University

Sertoli cells secrete proteins which are necessary for spermatogenesis. Bovine and rat Sertoli cells were grown in culture with or without dibutyryl-cAMP, FSH, or testosterone added. All cultures were incubated for 24 hr in the presence of ^{3}H-leucine. The secreted proteins were isolated from the harvested medium and separated by slab gel electrophoresis. Fluorography was used to identify those proteins being actively synthesized by the cells. Androgen binding protein was tentatively identified by fluorography in samples from the rat, as two minor bands on SDS gels. ABP is not present as one of the bovine proteins. Major rat and bovine protein bands were identified by fluorography of SDS gel and were assigned approximate molecular weights. The hormones appeared to have an effect on the total quantity but not the type of protein being secreted.

50

Ku, G. and Krakauer, H. OXYGEN CONSUMPTION AND LYMPHOCYTE STIMULATION. Washington State University

The rate of oxygen consumption, an index of metabolic activity has been measured for lymphocytes undergoing simple culture as well as in the presence of the specific antigen, dinitrophenylated bovine serum albumin, of the mitogenic lectin concanavalin A, and of inhibitors of various aspects of cell metabolism. The modes of inhibition of DNA, RNA, protein synthesis, and interference with the structure of microfilaments are different in antigenic and mitogenic stimulation. The results suggest different metabolic pathways for antigenic and mitogenic stimulation of lymphocytes.

51

LASER RAMAN STUDIES OF fd B-PROTEIN. R.W. Williams[1], A.K. Dunker[1], B.P. Gaber[2], and W. Peticolas,[2] 1. Biochem./Biophys. Prog., Wash. St. U., Pullman, WA and 2. Dept. of Chem., U. of Ore., Eugene, OR.

The major coat protein from filamentous phage fd has been studied by CD. In the intact phage, the protein exists in an a-state, which has a high α-helix content. When incorporated into membranes at high concentration, the protein exists in a c-state which is mostly β-sheet. (Williams and Dunker, J. Biol. Chem. 252, 6253, 1977). Laser Raman spectra have been obtained of this protein. Using the method of Lippert, et al., JACS, 98, 7075, 1977, the protein in the a-state is estimated to be 62% α-helix, 14% β-sheet, and 24% random coil, which is in good agreement with the CD estimates. There are indications that the a-state contains some parallel β-sheet. In contrast, the method of Lippert, et al. gives estimates of ~63% α-helix, 145% β-sheet and 18% random coil, for the protein in the c-state.

52

Dunker, A. K., and Ackley, C. EFFECTS OF UREA ON THE ELECTROPHORETIC MOBILITY OF SDS-PROTEIN COMPLEXES. Washington State University

Addition of 8M urea reduces by about 45% the electrophoretic mobility of most sodium dodecyl sulfate (SDSO-protein complexes through polyacrylamide gel. The increased viscosity and the increased dielectric constant due to the addition of urea would be predicted to reduce the electrophoretic mobility by about 52% overall. The discrepency between these two numbers is small but significant. Two obvious possibilities to explain the discrepency are that urea induces a significant change in shape of the SDS-protein complex and/or that urea induces a significant change in the SDS binding by the protein. Experiments are in progress to distinguish these two possibilities.

53

Willmes, H. GAMMA-SPECTROSCOPY WITH HEAVY-ION INDUCED REACTIONS
University of Idaho

The distribution of final nuclei following the reaction ^{19}F + ^{27}Al has been investigated as a function of energy of the ^{19}F beam. The results are compared with statistical model calculations. Spectroscopic information about high-spin states in ^{37}Cl, ^{39}K, ^{40}K and ^{42}Ca has been deduced from γ-γ coincidence measurements at 70 MeV and γ angular distributions at 75 MeV beam energy.

54

The Decomposition of Formic Acid on Ru (1010)
L.A. Larson and J.T. Dickinson
Physics Dept. W.S.U.

The decomposition of HCOOH on Ruthenium has been studied using the technique of Thermal Flash Desorption. The main decomposition products are H_2, CO_2, H_2O, and CO. The H_2 and CO_2 products desorbed in identical peaks, with first order kinetics, indicating that this reaction path is decomposition limited. The H_2O and CO products desorbed in a manner that indicated that the reaction is limited by the availability of CO adsorption sites. At multilayer coverages the HCOOH condenses in the molecular state. Activation energys and mechanisms will be discussed.

55

Tribo-Stimulated Exo-Emission from Oxide Covered Aluminum

Washington State University, Physics Department
D.L. Doering, J.T. Dickinson, P.F. Braunlich

Electrons, ions, and photons are known to be emitted from a number of oxide covered metals during tensile deformation. This effect, known as tribo-stimulated exo-emission, has been shown to be related to the cracking of the oxide layer. Exo-emission from several oxides have been studied for bare and aluminum clad Al 2024 and Al 7075. Oxides are varied in thickness, structure, and chemical properties. This investigation reveals that many features of the characteristic exo-emission curve (emission rate vs. strain of the substrate) are sensitive to slight changes in the oxide. These results suggest this to be a useful method for the characterization of surface oxide layers.

56

Chao, Y.F., Baierlein, R. and McIntosh, J.S. The SCATTERED SPECTRUM OF A MEDIUM CONTAINING TURBULENT NOISE. Wesleyan University

The spectral distribution of electromagnetic waves scattered by density fluctution in a homogeneous, isotropic turbulent medium has been studied. The time-dependent density fluctuation is predicted by the hydrodynamic equations which are quasi-linearied with respect to the acoustic parameters. The interaction between the acoustic field and vortex field is retained. The power spectrum is evaluated for stationary turbulence at high Reynolds number. The frequency distribution of the scattered spectrum is found to be similar to that of a quiet fluid. By including the turbulent noise effect, this work extends the results of Mountain (1).

(1) Mountain, R.D. (1966) Rev. Modern Phys. 38, 205.

57

SOME CONTRIBUTIONS OF CONIFER BIOME RESEARCH TO FORESTRY IN THE NORTHWEST

by S. P. Gessel and R. Edmonds, College of Forest Resources, University of Washington

The total scope of the Conifer Biome Research effort is briefly reviewed. Contributions to forestry are considered under three categories.

1) Those related to theory. Specific examples include mineral cycling, succession, stand development and productivity;

2) those related to forest practices include forest fertilization and forest productivity, forest harvest, erosion, stand manipulation;

3) those related to forestry education: introduction of new concepts in teaching, training of graduate students.

These topics are developed further in the presented paper and specific examples of Biome research are cited.

58

Overton, W. Scott; D. P. Lavender & D. D. McCreary ESTIMATION OF FOLIAGE BIOMASS IN YOUNG-GROWTH DOUGLAS-FIR (Pseudotsuga menziesii) Oregon State University

The entire crowns of sample trees were harvested from both heavy and lightly thinned plots of a young-growth Douglas-fir stand in Benton County, Oregon. A plot of foliage weight (A) versus sapwood basal area (B) demonstrates for this stand that "B" does not predict "A", on an individual tree basis. Further, the relation of B to A seems to be related to the intensity of thinning. A sampling protocol which permits accurate estimation of the total foliage of a given tree is described.

59

Del Rio, Ernest and Alan B. Berg THE EFFECT OF LIGHT ON LEAF AREA OF DOUGLAS-FIR REPRODUCTION UNDER MANAGED STANDS IN COASTAL OREGON Oregon State University

Leaf area measurements of 38 young natural Douglas-fir growing under a broad range of light conditions suggest that the ratio of leaf surface area to leaf dry weight (cm^2/g) is inversely proportional to a logarithmic transformation of daily sunlight received at the crown; this appears true from as low as 1.28% to full sunlight. These results indicate that leaf morphology of Douglas-fir is sensitive to the particular light regime in which a tree grows, that all degrees of shade leaves exist, and that strategies for survival alter with environment.

60

White, T. L., K. K. Ching & D. P. Lavender GENETIC VARIATION IN SEED CHARACTERISTICS AND HEIGHT GROWTH AMONG OPEN POLLINATED DOUGLAS-FIR FAMILIES Oregon State University

Open pollinated seed was collected from each of two trees on each of 35 sites (total of 70 families) in southwestern Oregon. The seeds were sown into Weyerhaeuser-type plastic tubes (1" diameter and 4" long) containing 3:2 peat:vermiculite. This paper reports the genetic variation in seed characteristics and first-year height growth among these families. The genetic correlations between family means of these response variables and the characteristics (elevation, latitude, etc.) associated with the site of seed collection are also reported.

61

Nelson, E. A., J. B. Zaerr, and D. P. Lavender. OCCURRENCE AND VARIATION OF IAA AND ABA IN WESTERN HEMLOCK SHOOTS. Oregon State University

Indole-3-acetic acid (IAA) and abscisic acid (ABA) were identified by gas-liquid chromatography in partially purified methanol extracts of western hemlock shoots. Seasonal changes in the endogenous levels of these hormones were found that were similar to those reported for several other species. The ratio of the level of ABA to that of IAA correlated well with the distinct phases of dormancy although no casual relationship was implied. The concentration of ABA in western hemlock seedlings was only slightly affected by the photoperiod which the seedlings received but was radically increased if seedlings experienced moderate moisture stress.

62

Krumlik, G.J. SOME ASPECTS OF NUTRIENT CYCLING IN SUBALPINE CONIFEROUS FORESTS. Can. For. Serv., North. For. Res. Cent., Edmonton, Alberta, Canada

Quantity of the above-ground tree biomass, annual net primary production, tree litterfall and throughfall, forest floor biomass and macronutrient turnover were measured on 12 sample plots representing three plant associations of the Subalpine Mountain Hemlock Zone (Krajina 1965) of southwestern British Columbia. Elevation of sample plots was from 1250 to 1450 m above sea level.

Above-ground tree biomass was 389-731 t/ha, tree litterfall 1.48-3.02 t/ha, litterfall ash content 2.8-4.9%, annual net primary production 1.77-3.08 t/ha, forest floor biomass 88-190 t/ha, and tree age 300-450 years. Predominant elements in litterfall were calcium and nitrogen. On the 10 point scale classification of Rodin and Bazilevich (1967), these forests can be described as calcic-nitric B_{8-10}, L_{2-3}, D_1, A_{4-5}.

63

Radwan, M. A. and D. S. DeBell. RELATIONSHIPS BETWEEN SITE INDEX, GROWTH, AND FOLIAR CHEMICAL COMPOSITION OF WESTERN HEMLOCK. USDA Forest Serv., PNW Forest & Range Exp. Stn.

Site index, growth, and foliar contents of the essential elements, Al, and the chlorophylls of 20- to 30-year-old western hemlock (Tsuga heterophylla) trees were examined during the winter in 8 natural stands in both coastal and Cascade zones of western Washington. Site indices at 50 years ranged from 22 to 38 m. Terminal growth and needle concentrations of most nutrients and the chlorophylls varied between and within zones and among the 8 stands. Site index was correlated positively with terminal growth, total N, chlorophyll 'a', total chlorophyll, and Fe, and negatively with Mn. Also, total N was correlated with both chlorophyll 'a' and total chlorophyll. Results suggest that site productivity may be improved by cultural treatments that would increase N and chlorophyll contents and Fe/Mn ratios in needles. In addition, chlorophyll content may be useful as a simple indicator to estimate N status of trees and assess site quality.

64

Lopushinsky, W., and G. O. Klock. EFFECT OF DEFOLIATION ON SAP VELOCITY IN GRAND FIR
USDA Forest Service, Pacific Northwest Forest and Range Experiment Station, Wenatchee, Washington

Paraquat was aerially sprayed on large grand fir (Abies grandis (Dougl.) Lindl.) trees to simulate defoliation by Douglas-fir tussock moth (Orgyia pseudotsugata McD.). Sap velocity was measured before and after spraying. Trees which later became severely defoliated showed a measurable decrease in sap velocity one day after spraying. Sap velocity in these trees declined rapidly after mid-July to near base values in early September, whereas rates in nearby unsprayed control trees declined gradually, reaching low values in mid-November. Maximum reduction of sap velocity in severely affected trees occurred in mid-August when sap velocity rates were only 27 percent of maximum compared to 69 percent for control trees. No consistent changes in sap velocity were found in trees which later became only slightly defoliated.

65

Nnyamah, J.U. and T.A. Black. EFFECT OF THINNING ON THE EVAPOTRANSPIRATION OF A DOUGLAS-FIR FOREST. Univ. of British Columbia, Vancouver, B.C.

The study was carried out in two adjacent 20-year old stands of Douglas-fir trees. The unthinned stand (1840 trees/ha) had virtually no undergrowth, while the thinned stand (840 trees/ha) contained considerable salal undergrowth. Both sites had similar radiation regimes and soil type. Stand evapotranspiration values of both sites were compared for similar root zone water storage values and net radiation regimes. Average rates of transpiration of individual trees in each stand were also calculated. The analysis was done for dry summer periods commencing after continuous rainfall. Overall stand evapotranspiration at both sites was very similar but individual trees at the thinned site transpired significantly more than those at the unthinned site.

66

Baldwin Jr., V.C. Tree spatial pattern and density in some forest types of Northeastern Oregon
Washington State University.

Spatial pattern and density of trees at eight different locations in Northeastern Oregon were estimated using both quadrat and point to nearest individual techniques. Pattern and density are presented for the naturally occuring mixed species combinations as well as for individual species. Correlations between pattern and density and past management practices are also given.

67

Sawyer, J. O. DYNAMICS OF DOMINANT TREES IN MIXED EVERGREEN FORESTS OF NORTHERN CALIFORNIA. Humboldt State University

Pseudotsuga menziesii and *Lithocarpus densiflora* are the most important trees in the mixed evergreen forests of northern California. The canopy of a mature modal community consists of an irregular upper stratum of *Pseudotsuga* to 65m, and a lower more continuous stratum of *Lithocarpus* to 35m. Some immature forests are dominated by *Pseudotsuga*, while others are dominated by *Lithocarpus*, still others contain various mixtures. Competitive interactions in all cases result in mature mixed forests where both species share dominance.

68

Parminter, J.V. Forest Encroachment onto Grassland Range in the Chilcotin Region of British Columbia.
Grad. Stud., Fac. For., UBC

The encroachment of forest trees onto grasslands in Western N. America has been variously attributed to fire exclusion, domestic grazing, and climatic change. The establishment of Douglas-fir on grassland range in south-central B.C. was found to be a function of the interaction of domestic grazing and the absence of fire. Establishment and survival of the Douglas-fir reproduction are influenced by available soil moisture. Initial advance of the forest depends on seed from the parent stand and on favourable microsite conditions. Continued advance will occur as the invading trees produce seed and ameliorate the microclimate. Stand age structure, fire history, and the land management implications of forest encroachment are discussed.

69

Larson, M. J.
REGENERATION OF MEADOW-ASSOCIATED FOREST STANDS IN CENTRAL NORTH IDAHO
University of Idaho

Meadow vegetation currently occupies productive low-lying forest sites in the Thuja-Tsuga Zone in northern Idaho. Meadow expansion onto these sites was attributed to disturbance by man through logging, fire, and grazing. Both original and seral stand characteristics were determined from field surveys, and meadows were found to be slowly reinvaded by forest vegetation. Lodgepole pine was the most successfully invading tree species; western white pine exhibited the best growth, while grand fir rapidly invaded established pine stands. Causes of damage to tree species were identified with snowbend and frost damage deemed important. Successional roles of tree species were identified and silvicultural implications of timber harvest on these sites were drawn.

70

Arno, S. F. INVESTIGATIONS OF FIRE HISTORY IN THE NORTHERN ROCKY MOUNTAINS
USDA Forest Service, Forestry Sci. Lab, Missoula, MT

Recent fire history studies in various areas of the northern Rocky Mountains have shown that historic fires occurred with vastly different frequencies and had markedly different effects on this region's diverse forests. Historic fires maintained many-aged open stands of seral trees in some habitats while characteristically replacing the stands in other habitats. Often fires burned at variable intensities creating a patchwork of treatments on the forest landscape. This resulted in a mosaic of stands differing in tree species compositions and age-class structures. An improved knowledge of fire history and the "natural role of fire" in each forest type is essential for developing realistic approaches to fire and natural resource management.

71

Antos, J. A. POST-FIRE SUCCESSION IN ABIES GRANDIS FORESTS OF THE SWAN VALLEY, MONTANA
Department of Botany, University of Montana, Missoula

The Swan Valley of Northwestern Montana supports mesic low elevation forests in which Abies grandis is a major climax species. Replacement burns are the most important disturbance factor, being frequent enough to prevent most stands from attaining a climax status. The overall fire maintained vegetation mosaic is stable but any individual site can support a wide array of vegetation depending on fire history. Seral tree species composition is determined in the first few years after fire. Conditions for the establishment of shade tolerant species are best during the early years of stand development. The ratio of Thuja plicata to Abies grandis in a stand is often determined then. The conditions leading to the different types of stands will be discussed.

72

Stewart, W.L. MOUNTAIN GRASSLAND AND SHRUBLAND HABITAT TYPES OF WESTERN MONTANA
Washington State University

Resource potentials differ greatly between and within major vegetation types. Recognizing this, a classification system for grasslands and shrublands of western Montana was developed. Natural vegetation occupying a particular site is viewed as an environmental integrator and reflects biotic potential. This system recognizes the need for basing management on discrete units of similar biotic potential responses. A total of 610 stands were sampled for vegetation and environmental data, which wereanalyzed by means of ordination, cluster analysis and association tables. A dichotomous vegetation key was prepared to assist recognition of series, habitat types and phases in the field.

73

Clausnitzer, R.R. and B.A. Zamora PREDICTORS OF ANNUAL UNDERSTORY PRODUCTION IN THE ABIES GRANDIS-PACHISTIMA MYRSINITES HABITAT TYPE

Washington State University

Multiple linear regression techniques were used to construct independent prediction equations for annual production of twelve understory components in the Abies grandis-Pachistima myrsinites habitat type of the Blue Mountain Region in Washington and Oregon. Prediction variables include the following characteristics of the tree overstory and variables linked to the successional status of sampled stands: canopy coverage, stem density, crown ratio, tree height, diameter and basal area functions. The understory production models account for 35% to 70% of the variability in annual production during the period of maximum growth.

74

Minore, D. NORTHWESTERN HUCKLEBERRY MANAGEMENT RESEARCH--A FIVE-YEAR SUMMARY. USDA Forest Service, Forestry Sciences Laboratory, Corvallis, Oregon.

Forest Service huckleberry research began in 1972. Controlled burning, cutting, bulldozing, sheep grazing, several herbicide applications, and root rot inoculations were applied to replicated experimental plots. Annual measurements of vegetative cover and berry production on these plots indicate that 2,4-D applied to frills cut in individual overstory trees significantly increases huckleberry production. Investigations of huckleberry physiology and morphology, fertilization experiments in both field and greenhouse, quantitative studies of subalpine succession, and a study of huckleberry site quality also were accomplished during the five-year research program.

75

DeByle, Norbert V. LARCH/DOUGLAS-FIR CLEARCUTTING AND BURNING EFFECTS--A HOLISTIC RESEARCH APPROACH. Intermtn. For. & Range Expt. Sta., Logan, Utah.

The effects of clearcutting and/or burning over an array of fire intensities and environmental conditions were monitored since 1967 in the western larch--Douglas-fir forest type in western Montana. Multidisciplinary research included measures of fire characteristics, burn accomplishment, smoke dispersal, convection column height, quality and quantity of runoff water, soil erosion, soil chemistry, tree regeneration, vegetal development, plant succession, and small mammal populations. Prescriptions are available for broadcast burning of logging debris to achieve specific land management objectives. More than 20 publications have reported specific phases of this work; a summary publication is being printed. This paper highlights results from the multidisciplinary summary.

76

Stage, A. R. METHODS FOR PREDICTING MANAGEMENT EFFECTS IN THE GRAND-FIR-CEDAR-HEMLOCK ECOSYSTEM

Ability to foresee the consequences--in the long run--is the foundation for decision-making in forest management. A coordinated research program for the grand fir-cedar-hemlock ecosystem has assembled a collection of forecasting methods that relate effects of management on forest cover, wildlife, and streamflow. Components of this assemblage have been designed to interact so that trade-offs among resource uses can be evaluated. Many of the components will be discussed in the following reports. These models are also used as a basis for pest management, but this application will be reported in the compendiums of the several major pest research programs.

77

Ferguson, Dennis, and R. J. Boyd PREDICTING SUCCESS OF REGENERATION ESTABLISHMENT. USDA For. Serv., Intermt. Stn.

A regeneration establishment model for conifers in three Northern Rocky Mountain habitat types is described. The model is based on random sample surveys of past regeneration cuts and their subsequent history of regeneration. The model predicts stocking probabilities, number of trees per unit area, and species and heights of regeneration as functions of regeneration method, site preparation, time since disturbance, species planted, habitat type, slope, aspect, elevation, and seed source distance. Linkage with a model of regeneration development is provided.

78

Foiles, M. W., D. P. Hanley, and W. R. Wykoff HEIGHT GROWTH MODELING OF CONIFEROUS REGENERATION. USDA, For. Serv., Intermt. Stn.

A model to predict height increment of coniferous regeneration in the grand fir-cedar-hemlock ecosystems of northern Idaho, western Montana, and northeastern Washington was developed using measurements from 3600 trees in 160 stands. Stand and site descriptive information used to model development of trees from 1 ft in height to 4.5 inches d.b.h. includes habitat type, elevation, aspect, slope, overstory/understory density, and shrub cover. These regeneration development equations were incorporated into the Intermountain Station's prognosis model for stand development. Use of the model will help forest managers compare a variety of silvicultural treatments.

79

Moore, J. A. THE EFFECT OF TUSSOCK MOTH DEFOLIATION ON GROWTH AND DEVELOPMENT OF JUVENILE GRAND FIR AND DOUGLAS-FIR. J. A. Moore, Assistant Professor College of Forestry, University of Idaho, Moscow, ID

An existing simulator of individual tree growth and development was adapted to model juvenile grand fir and Doulgas-fir, and used to assess height, crown, and radial growth response to defoliation of various intensities and durations. Defoliation effects on the dynamics of stand development were simulated to estimate the indirect impacts of tussock moth defoliation. The derived growth impacts can then be integrated into the coniferous regeneration portion of the Intermountain station's prognosis model for stand development. The forecasting ability of the prognosis model should be improved by using this information to more accurately reflect the effects of defoliation.

80

Wykoff, W. R., and M. W. Foiles WHAT IS THE THINNING EFFECT ON DIAMETER GROWTH IN RELATION TO STAND DENSITY? USDA For. Serv., INT

Data were collected from 160 semipermanent sample plots to measure development of trees on stands which had received a prior thinning treatment. These data were merged with diameter growth records from Forest Service inventories in northern Idaho, western Montana, and eastern Washington. Diameter increment models were fitted to this combined data base using linear regression methods. Several transformations of stand density and tree competitive status were used to test hypotheses about the course of tree growth following thinning. The resulting models were incorporated into Intermountain Station's growth prognosis program and tested by tracking the development of thinned permanent sample plots.

81

Scanlin, D. C. RESPONSE OF INLAND EMPIRE STANDS OF GRAND FIR AND DOUGLAS-FIR TO NITROGEN FERTILIZATION. University of Idaho

Forest fertilization can be an effective management practice in North America. Both Abies grandis (Dougl.) Lindl. and Pseudotsuga menziesii (Mirb.) Franco in the Inland Empire have shown considerable response to urea-nitrogen additions in some stands. Response is variable, however, and may be related to soil, habitat, and stand factors. Thinning, in conjunction with fertilization, may accelerate growth to a much greater extent than either practice alone and with greater probability of success.

82

Hatch, C. R. CROWN RATIO EQUATIONS FOR 12 CONIFERS IN THE NORTHERN ROCKY MOUNTAIN REGION
College of Forestry, Wildlife and Range Sciences

Mathematical relationships are presented which estimate crown length of trees under alternative management practices. These relationships are derived from 39139 individual sample tree observations located on plots established as part of the management planning inventory on 13 national forests in northern Idaho, eastern Washington, and Montana. Separate equations using stand and tree variables are developed by habitat type for each of the following species: western white pine, whitebark pine, lodgepole pine, ponderosa pine, western larch, Douglas-fir, grand fir, subalpine fir, Engelmann spruce, western red cedar, western hemlock, and mountain hemlock.

83

Larry L. Irwin EFFECTS OF ROAD CLOSURES ON ELK IN NORTHERN IDAHO Univ. of Idaho, College of F.W.R., Moscow

A study was conducted during 1975-1977 to determine the effects of varying the size of area road-closures to habitat use behavior of elk (Cervus elaphus). Elk were radio-tracked when access roads remained open, were closed in a 40 km^2 area, and were closed in a 75 km^2 area during 1 September through 1 November. Results indicated road closures allowed elk to stay longer within preferred areas, but tradition and habitat characteristics also influence elk habitat use behavior.

85

Belt, G. H. PREDICTING THE EFFECTS OF FOREST PRACTICES ON STREAMFLOW. College of Forestry, Wildlife and Range Sciences, University of Idaho.

Changes in vegetative cover due to forest practices such as clearcutting, thinning, road construction, powerline or ski slope development can alter annual streamflow both spatially and temporally. The equivalent-clearcut-area (ECA) model evolved by USFS hydrologists provides a means for estimating such changes considering present hydrologic condition and projected changes in land use. In this study the predictive capability of the ECA model was evaluated using data from Benton Creek, a 950 acre forested drainage in northern Idaho. No statistically significant difference between measured and predicted annual streamflow was found during a 5-year posttreatment period. However, the model underestimated the 5-year average measured streamflow.

86

Askham, Leonard R. RECREATION SUBDIVISI[illegible]
LANDS: THEIR SOCIAL AND ECONOMIC IMPAC[illegible]
Cooperative Extension Service, Wash. St[illegible]

The impact of recreation subdivisions [illegible] lands near rural communities is not [illegible] known. studies have been conducted and those [illegible] at have tend to be either economic analyses of the industry developmental profiles, or problem analyses. This study develops a socio-economic profile of recreation lot owners, reasons for purchasing their properties, use they make of them over the years, or what might do with these properties in the future addition, this study explores the amenities, facilities and services desired, and compares the values study group with those of year-round residents on local issues.

87

Firman, A. S. and J. E. Hoffman. An Evaluation of the Waterton-Goat Haunt Volunteers in Parks Program, Summer, 1977.
College of Forestry, Wildlife & Range Sciences, University of Idaho

The Waterton section of Glacier National Park is located in the northern portion of the Park along the U.S.-Canadian border and is the area drained by the Waterton River and the streams entering Waterton Lake. The Goat Haunt Ranger Station located on Waterton Lake, serves as a major trailhead for back-country use.

In order to determine the interpretive potential of the Goat Haunt-Waterton Area of Glacier Park, a Volunteers in Parks (VIP) Program was initiated during the summer of 1977.

The major objectives of the VIP program were to: 1) provide limited experimental interpretive services and to 2) determine visitor characteristics, expectations and desires in order to develop an interpretive plan for the Goat Haunt Area.

88

Tomlins, F.L. & Hoffman, J.E. AN ANALYSIS OF SCHWEITZER BASIN SKIERS. Univ. of Idaho College of Forestry, Wildlife, and Range Sciences.

The preliminary results of a study to determine the characteristics of skiers at Schweitzer Basin ski area, Sandpoint, Idaho, are presented. A survey was conducted to determine what aspects of the ski area were important to skiers in their decisions to ski at this area. A factor analysis of the responses was made and the skiers were grouped according to their attitudes towards each factor. The characteristics of the users within each group were then analyzed and compared.

89

FRANC, G.C. THE RESULTS OF AN ATTEMPT TO CONTROL THE MOUNTAIN PINE CONE BEETLE WITH THE INSECTICIDE FURADAN. CLEARWATER NATIONAL FOREST

The mountain pine cone beetle(Conophthorus monticolae Hopkins) is a cone and seed destroying insect of western white pine (Pinus monticolae Dougl.) The work of collecting seed for progeny testing in the white pine tree improvement program has been hampered by the activities of this insect. In the Southeast, where a similar cone beetle attacks eastern white pine cones, losses in seed orchards have been reduced by the application, through the soil, of a systemic insecticide called Furadan. A study was made to determine if ground application of Furadan could be used to protect western white pine cones from cone bettle damage. Using the application procedures described in this report, Furadan did not effectively reduce cone losses.

90

Stock, M. W. CURRENT TAXONOMIC STATUS OF THE MOUNTAIN PINE BEETLE, Dendroctonus ponderosae
College of Forestry, University of Idaho

The history of the taxonomic status of the mountain pine beetle is complex and still ambiguous. Over its distributional range, this insect shows considerable behavioral variation and many populations are separated by large distances. Genetic studies are beginning to reveal ways in which the systematic status of subgroups within this species can be more clearly defined.

91

Scurlock, John; R. G. Mitchell; K. K. Ching
NOBLE FIR: REDUCED SEED PRODUCTION CAUSED BY SEED AND CONE INSECTS
Oregon State University

An investigation of noble fir seed and cone insects was undertaken to gain basic information on the identity and biology of these insects and their effect on seed production. Insects causing the greatest amount of damage in sample cones included seed chalcids (Megastigmus sp.) and cone maggots (Earomyia sp.). In addition, scale midges, gall midges, and at least five species of cone moths were encountered. A weekly bagging experiment yielded information concerning times of attack related to developmental stages of cones.

92

Aho, P. E. ORIGIN OF FROST CRACKS IN GRAND FIR (ABIES GRANDIS (DOUGL.) LINDL.) IN THE BLUE MOUNTAINS
Pacific NW Forest & Range Experiment Station

Eighteen grand firs, each with one or more frost cracks, from three areas were felled and dissected to determine origin of the seams. Cracks in all trees were associated with old wounds, most commonly caused by basal fire injuries (17 of 18 trees) which occurred when the trees were very small. These wounds lay 15 to 61 cm below the present ground line. Usually the largest and often the only crack began at the face of the wound where inrolled callus growth caused a weak point. The combination of injury, associated wetwood, and freezing weather commonly causes frost cracks in grand fir.

93

Chapman, R.C. PLOT SPACING IN SYSTEMATIC SAMPLING DESIGNS, Washington State University.

Determination of sample size and spacing of plots in systematic sampling is usually determined in two steps. A modification of existing sample size and systematic plot spacing equations provides a simple equation that can be easily used by field personnel to determine plot spacing in square and rectangular systematic sampling designs. The new equation provides an easy method of evaluating the influence of allowable error, level of confidence, size of area and population variability upon plot spacing. The new equation clearly illustrates such well known facts: that as the size of the area increases the distance between plots increases and that as population variability increases the distance between plots decreases for a given size area.

94

Williamson, R. L. APPLICABILITY OF FOUR REGIONAL VOLUME EQUATIONS FOR ESTIMATING GROWTH RESPONSE TO THINNING IN DOUGLAS-FIR. USDA For. Serv., PNW For. & Range Exp. Stn.

Volumes and volume growth in cubic feet of 72 trees in control, lightly thinned, and heavily thinned stands, derived via stem analysis, were compared with volumes and volume growth derived from four different regional volume tables based on d.b.h. and height. The comparisons showed that average bias of each volume table was unaffected by treatment and that growth estimates based on these volume tables should be within 10 percent of true values.

95

Smith, J.H.G. TREE-RING ANALYSES HELP DEFINE MANAGEMENT REGIMES FOR RED ALDER.
Faculty of Forestry, University of British Columbia, Vancouver, B.C. V6T 1W5, Canada.

In natural stands of red alder (Alnus rubra Bong.) heavy self thinning is common. Trends in numbers of trees over dbh or height and initial increase in size from thinning can be approximated from a suitable range of plots. But there are few data on growth following planting or early control of spacing in managed stands. Therefore, annual widths of rings were measured on cores from breast height. Trees from 10, 25 and 40 year-old clearings and from logging up to 80 years ago were sampled with points and plots. Radial growth of open trees was compared with that of forest-grown trees. Effects of tree size, crown characteristics, number of rings from pith, and calendar year were obvious. Nevertheless, analyses of past growth of trees currently at low stand densities and without evidence of mortality should help define upper limits for quick growth to sizes desired for veneer and lumber.

96

Olson, J.R. INCREMENT CORE ANALYSIS: A MEANS OF ASSESSING RESPONSE TO TREATMENT IN WESTERN HEMLOCK; College of Forest Resources, University of Washington, Seattle, WA 98195

Estimates of fertilizer response in natural stands of coastal western hemlock (Tsuga heterophylla (Raf.) Sarg.) using traditional plot comparison techniques have shown to be variable and often confusing. Variability in structure within stands can create large differences in growth between plots which confounds statistical analysis. Increment core analysis has proven to be a more sensitive technique as it provides a means to, 1) assess structure and pretreatment radial growth differences between plots, and 2) estimate future growth based on projections of past growth trends. Estimates of fertilizer response in treated stands are based on differences between projected growth (as if untreated) and actual (treated) growth.

97

Illgner, J.L. DESCRIBING AN AREA FOR DESIGNATION AS A NATURAL AREA. University of Montana

The Montana State Natural Areas Act was passed in 1974. The Act designated the responsibility for developing and implementing the natural areas program to the Department of State Lands and the Natural Areas Advisory Council. They outlined procedures for natural area nomination through designation. During the following two year period, nominations were received for 25 natural areas, but descriptions of the respective area's physical and biological features were not completed. The purpose of this study was to organize a comprehensive description of the aquatic, geological, zoological and vegetational features of one nominated state natural area, including suggestions for a management plan. This would provide the information required for natural area designation.

98

Gordon, R. and I. Mitchell. Revegetation efforts on perturbed soils near Kellogg, Idaho.
College of Forestry Wildlife and Range Science, University of Idaho, Moscow, Idaho 83843

An area surrounding lead and zinc smelters near Kellogg, Idaho has been denuded for 50 years, due initially to logging and wildfire, but more recently to smelter emissions and other mining operations. For the past five years the University of Idaho has been conducting a multi-faceted research program on the site under the auspices of several grants. Among the projects evaluated are species screening tests, soil amendment studies, evaluation of terracing, heavy metal uptake and fertilization studies. Ideas for future efforts at revegetation are discussed.

99

Veirs, S.D. EXPERIMENTAL REHABILITATION OF CUTOVER REDWOOD FOREST LAND
U.S. National Park Service, Redwood National Park

Redwood National Park includes 11,000 acres of redwood forest land logged before park establishment. 33,000 acres of more recently logged land may be added by new legislation and a rehabilitation program may be mandated by Congress to referse the accumulated impacts of logging upon downstream parkland resources. A series of experimental trials of rehabilitation techniques were carred out on 10-to-15 year-old clearcuts during autumn 1977 using both heavy equipment and hand labor. Methods were employed to correct altered drainage patterns, reduce erosion, and reestablish vegetation on hillslopes, roads, and mass movement features. Item costs were determined and effectiveness was monitored through the winter season. Rationale, results and implications for large scale rehabilitation of redwood forest land are discussed.

100

Smith, R. B. GROWTH OF NATURALLY ESTABLISHED TREES ON SKIDROAD AND UNDISTURBED SURFACES IN THE ENGELMANN SPRUCE-SUBALPINE FIR ZONE, BRITISH COLUMBIA. Can. For. Serv., Pacif. For. Res. Centre, Victoria, B.C.

Heights of Engelmann spruce and subalpine fir trees naturally established on contour skidroads in steep clearcuts 9 to 22 years of age were compared with trees growing above and below the roads. Growth varied with position on skidroad, soil characteristics and aspect. It was generally slowest on the inner portion of the skidroad (cutbank and inner track) and increased toward the outside (outer track, berm, and sidecast). On some clearcuts, growth on the outside portion was greater than in the "undisturbed". Overall adverse effects of skidroads on tree growth were most pronounced on medium-to fine-textured soils derived from calcareous parent material; whereas, such soil disturbance was judged to have beneficial effects on tree growth on moderately coarse and acid soils on cool aspects.

101

Morris, John W. and Joe B. Zaerr FIELD CANOPY EFFECTS ON SHOOT TO ROOT RATIO OF WESTERN HEMLOCK SEEDLING
Oregon State University

Western hemlock seedlings grown under open, edge, and closed canopies from spring through late fall exhibited different shoot to root ratios. Shoot to root ratios were significantly higher under the closed canopy and reflect reduced root dry weight. Canopy effects influenced control, top pruned and root pruned treatments similarly. Control and root pruned seedlings showed an approximate three fold increase under the closed canopy while top pruned seedlings approximately doubled their shoot to root ratio.

102

Rischbieter, N.O., and J.R. Gutzwiler, DOUGLAS-FIR PLUG SEEDLING PERFORMANCE AS AFFECTED BY DIBBLE-PLANTING. Weyerhaeuser Company

Containerized Douglas-fir seedlings planted with shovel, flat planting bar, and hollow and conventional dibbles did not differ significantly in root development after two years, or shoot performance three years after planting in a dense clay soil. Although dibble-planted seedlings generally produced fewer total roots than seedlings planted with the bar or shovel, resulting root systems were symmetrical and are predicted to provide comparable physical support, and moisture and nutrient absorbing capabilities as tree size increases.

103

Emmingham, Wm. H. Strategies for Identifying Drought Resistant Douglas-Fir Sources
Willamette N.F./Oregon State University

New techniques for investigation of plant water relations have promise for selecting more drought resistant Douglas-Fir sources. Genetic differences in control of water loss have been demonstrated in research trials, but the practical problems of screening large numbers of candidates remain. Future efforts to screen sources should consider the daily and seasonal patterns in water use, the limitations imposed by instrumentation and the associated sampling problems.

104

Solomonson, M. H., and R. M. Kenady AN EVALUATION OF DEWATERED SLUDGE PROPERTIES AND THEIR EFFECT ON CONIFEROUS SEEDLINGS. University of Washington.

Causes of high mortality among coniferous seedlings planted in dewatered sewage sludge were investigated. In this study plant moisture stress (PMS) and root mortality were evaluated for Douglas-fir and Sitka spruce seedlings planted in fresh and aged sludge. Root and shoot samples were taken at two-week intervals for a period of seven weeks. Oxidation-reduction potential, electrical conductivity, pH, and ammonium concentrations of fresh and aged sludge were measured. PMS, and root and needle mortality of seedlings planted in fresh sludge increased. PMS of seedlings planted in aged sludge decreased, and no significant mortality was observed. Fresh sludge was poorly aerated, with high ammonium concentration and high pH.

105

Duryea, M. L. EFFECTS OF ROOT WRENCHING ON THE STOMATAL CONTROL OF DOUGLAS-FIR 2-0 NURSERY STOCK
Oregon State University

Two-0 Douglas-fir seedlings underwent either (1) no wrenching, (2) single wrenching, or (3) multiple wrenching while in beds at the Webster Nursery near Olympia, Washington and at the Phipps Nursery near Elkton, Oregon. Leaf conductance of water vapor was measured with a null-balance diffusion porometer following each wrenching. Non-wrenched seedlings exhibited a higher maximum morning leaf conductance which slowly decreased over the day indicating little stomatal closure. Leaf conductance of wrenched seedlings was at a maximum in the early morning followed by a sharp decrease during the day indicating stomatal closure. Other measurements included root and shoot morphology and xylem water potential.

106

Gill, Ranjit S. & D. P. Lavender EFFECTS OF NITROGEN FERTILIZATION UPON THE RHIZOSPHERE AND GROWTH OF YOUNG-GROWTH WESTERN HEMLOCK Oregon State University

The report will discuss a project designed to: 1) describe the morphology of hemlock root systems on north coastal and Cascade sites; and 2) determine the effects of several nitrogenous fertilizers upon numbers of active and suberized roots, dead roots, and numbers and types of mycorrhiza. Results to date indicate that applications of urea have significantly raised soil pH in the rooting zone. The significance of this effect upon the numbers and species of mycorrhizal symbionts and upon the resultant growth of hemlock seedlings and saplings will be discussed.

107

Smith, H. W., Okazaki, R., and Knowles, C. R. SOME PUMICEOUS MEMBERS OF TEPHRA-SET Y IN WASHINGTON, IDAHO, AND OREGON. Washington State University and Idaho Bureau of Mines and Geology

Based on samples from localities in southeastern Washington and adjacent areas, we have widened and extended fallout areas for pumiceous members of Mount St. Helens tephra-set Y. As inferred from stratigraphy and content of Ca, K, and Fe in glass shards, several members of the set are in this area, not just tephra Ye. Studies of samples from northeast of the volcano demonstrate chemical uniformity of glass shards in tephra Yn. One or more hypersthene-bearing tephra units, commonly mixed with downwind layers of tephra Yn, include glass shards that differ chemically, for example in % K.

108

Elmendorf, J. and L. H. Fisk RESTUDY OF TERTIARY PLANT-BEARING STRATA OF THE PILOT ROCK AREA. Department of Biological Sciences Walla Walla College, College Place, WA 99324

Rocks bearing fossil leaf impressions near Pilot Rock, Oregon, have traditionally been referred to the Eocene Clarno Formation but our study of the mega- and microflora and comparison with other Tertiary floras in the Pacific Northwest has revealed that rocks of two different ages are present, one probably Paleocene and the other Miocene. The older of the two outcrops, located along East Birch Creek 16 km southeast of Pilot Rock, is both lithologically and florally quite distinct from the type Clarno. Leaves from this site most closely resemble those of the Paleocene Chuckanut Formation of northwestern Washington. A sequence of shales and siltstones along nearby Pearson Creek is assigned a Miocene age in agreement with Hogenson (1956).

109

Barnett, J. and L. H. Fisk PALEOECOLOGY OF A SEDIMENTARY INTERBED IN THE YAKIMA BASALT. Department of Biological Sciences, Walla Walla College, College Place, WA 99324

A thin diatomaceous tuff in the middle Yakima Basalt has yielded a diverse well-preserved late Miocene pollen and spore flora from which the paleoecology can be inferred. The interbed lies between the two lowermost flows of the Frenchman Springs member and has restricted outcrops in the Palouse River canyon just upstream from Palouse Falls, Washington. Of the 95 taxa recognized, most are warm temperate. The presence of aquatic plants, along with diatoms and the alga Pediastrum, indicates deposition in a shallow lake or pond. In a microsection taken through the interbed, aquatic and shore plants generally decrease in relative abundance while forest types increase in diversity and numbers, suggesting a shallowing or infilling of the body of water.

110

Beka, F.T. SQUAW CREEK-TYPE SULFIDE MINERALIZATION

Dept. of Geol.,Wash.State University,Pullman,WA99164

The Squaw Creek Prospect is situated at the south end of the multiply deformed Kootenay Arc, in the Northport mining district, northeastern Washington. The sulfide body is a breccia-localized lead/zinc mineralization within the fossiliferous Reeves Limestone-Middle Metaline Dolomite faulted contact. There are, at least, two pre-faulting episodes of folding. Breccia clasts are undeformed, and lithologically similar to the enclosing Middle Metaline Dolomite. The sulfides (pyrite, galena, sphalerite, and minor amounts of chalcopyrite) have been deformed, metamorphosed and recrystallized to various degrees. Homogenization temperatures of fluid inclusions average 300° C. The sulfide mineralization is 50 to 100 million years old.

111

Savina, M. E., and R. L. Farrington. EFFECTS OF LANDSLIDES ON STREAMS. University of California, Berkeley; U.S. Forest Service.

Aggradation, streambank erosion, secondary landslides, log jams, and debris flow scour on tributary streams of the Smith River in northern California can be traced to landslides occurring both naturally and from roads and cut-over areas. Landslide effects depend both on landslide characteristics such as volume, particle size, and mobility and on channel characteristics such as width, gradient, and bank material. The length of channel aggraded by a landslide is as much as 1220 meters. Aggradation has resulted in reduced low-water flows and increased channel widths. Total volume of sediment from secondary landslides and streambank erosion is greater along stream reaches affected by large landslides, than on adjacent stream reaches not so affected.

112

Logging and Testing of Deep Basalt Flows in Rattlesnake Hills No. 1 Exploratory Well.

Paul A. Eddy, Staff Hydrologist
Rockwell Hanford Operations

The downhole logging and testing of Rattlesnake Hills No. 1 was conducted in order to determine the geologic and hydrologic characteristics of specific flows within the Grande Ronde Basalt Formation of the Columbia River Basalt Group. Geophysical logs consisted of a six-arm caliper log, a three dimensional velocity log, a Seisviewer log, and a down hole camera. The geophysical information obtained was used for the installation of packers and conducting drill stem testing of various rock units. Testing showed permeabilities ranging from 10^{-3} to 10^{-7} cm/sec for the Vantage interbeds and 10^{-7} to 10^{-9} cm/sec within the flows themselves.

113

Brown, R.E. SOME OBSERVATIONS OF WATER WITCHING IN THE PASCO BASIN
Geological Consultant, Pasco

The 1977 drought, combined with the Pasco Basin's new residential and continuing agricultural boom, resulted in a new high in well drilling in south-central Washington. Public awareness that the best well sites were preempted and yields in new locales were highly questionable resulted in wide use of water witches or dowsers.

The failure rate of witched wells appeared much higher than normal although failures seldom are recorded and virtually never are admitted. The high failure rate can be ascribed to the inhospitable geological environment, the unfamiliarity of the witches with the new locales, and pressure for land development.

Case histories are cited. Numerous entertaining excuses for their failures explain why they claim near infallibility.

114

Heller, Paul GLACIAL DEPOSITS IN THE LOWER SKAGIT AND BAKER RIVER VALLEYS, WASHINGTON
Western Washington University

High terraces in the lower Skagit and Baker River Valleys are formed of glacial deposits. Pre-Vashon stade deposits consist of marine (?) silts and clays of Olympia Interglacial age (C^{14} age 25,500±350 yr., U.S.G.S. #117) and at least one till of unknown age. The lithology of this indicates it was deposited by a Cascade Valley glacier that traveled more than 30 kilometers from its source area. Fluvial and lacustrine sediments deposited in advance of Vashon continental ice form a thick fill in the lower Baker Valley and adjacent Skagit Valley. The overlying Vashon Till is best developed over the finest grained materials. An extensive ice-contact gravel fill marks ice recession in the lower Skagit Valley. Post glacial features include a massive landslide/mudflow, a pyroclastic flow and alluvial terraces.

115

Carson, R.J. RETREAT OF THE PUGET LOBE OF THE CORDILLERAN ICE SHEET FROM THE OLYMPIC PENINSULA, WASHINGTON Whitman College and Washington Division of Geology and Earth Resources

The Cordilleran Ice Sheet last occupied the Puget Lowland during the Vashon Stade of the Fraser Glaciation. At its Late Wisconsin maximum, the Puget Lobe reached to within 10 km horizontally and 150 m vertically of its most extensive (probably pre-Wisconsin) advance. Eskers SE of Dennie Ahl Hill, beside Tenas Lake & on the Quimper Peninsula are surrounded by hummocky moraine &/or dead-ice topography. In these and 4 other areas of ablation till &/or ice-contact stratified drift, the ice margin paused &/or stagnation occurred. Elsewhere there is shallow lodgment till &/or fluted surface, indicating relatively rapid retreat of an active ice margin. Meltwater channels and raised deltas containing recessional outwash are scattered throughout Mason and Jefferson Counties. Glaciomarine drift on Protection Island indicates rebound of 100 m.

116

Palmer, P. MARINE TERRACES AND RELATIVE SEA LEVEL CHANGES, WHATCOM COUNTY, WASHINGTON.
Washington Division Geology & Earth Resources, Olympia

Coastal terraces in Whatcom County are concluded to be marine in origin based on geomorphic relationships, profiling, grain-size analysis and geologic mapping. Terraces and strandlines vary from a major to a subtle aspect of the topography up to 200 feet in elevation on the mainland and nearby Lummi Island. Interpretation of the geologic history indicates that the terraces and strandlines probably formed 10,000 to 13,000 years B.P. as relative sea level varied rapidly in response to glacial isostacy and eustatic sea level changes.

117

Long, William A. GLACIAL GEOLOGY ALONG THE CREST OF THE SISKIYOU MOUNTAINS CENTERED ON LATITUDE 42°N

U. S. Forest Service, Gasquet, California

Deposits of three Wisconsin glacial advances are recognized along the crest of the Siskiyou Mountains centered on Latitude 42°N. Glaciation was minimal mainly because of low altitudes. Maximum lengths and lowest elevations attained by glaciers are: Early advance, 5 miles and 2800 feet; Middle advance, 4 miles and 3200 feet; Late advance, 1/2 mile and 4200 feet. Most morainal forms remain. From west to east cirque-floor altitudes rise with an average slope of about 45 ft/mi, from 3900 feet at Vulcan Lake 20 miles from the Pacific coast to 7150 feet at Mount Ashland 85 miles inland. Cirque-floor mean altitude is 5600 feet; general direction of glacier growth was northeast.

118

Brandon, M.T. THE STRUCTURAL EVOLUTION OF MESOZOIC ROCKS ON SOUTHEASTERN SAN JUAN ISLANDS, WASHINGTON
University of Washington

Geologic mapping of Mesozoic sedimentary and volcanic rocks on southeastern San Juan Island at a scale of 1:8000 indicates at least two distinct structural events. First, these rocks were imbricated during thrusting while in a partially consolidated state. This event was followed by development of a penetrative fracture cleavage and flattening of grains. Small-scale structural features indicate that at this time different lithologies were consolidated and had similar competence. The occurrence of metamorphic lawsonite in equivalent rocks elsewhere in the San Juan Islands (Cowan et al, 1975) suggests that these structural events are related to deformational events within a convergent margin.

119

Johnson, Samuel Y., THE GEOLOGY OF SPIEDEN ISLAND SAN JUAN COUNTY, WASHINGTON
University of Washington

Spieden and Sentinel Islands, in the northwestern San Juan Islands of Washington State, are underlain by the Upper Jurassic-Lower Cretaceous Spieden Formation. A stratigraphic section approximately 560 meters thick is exposed, and consists of lower and upper volcanic conglomerate strata separated by a sandstone-siltstone interval. Fossils indicate the presence of a large Upper Jurassic-Lower Cretaceous unconformity within the sandstone-siltstone unit. Structurally, the sedimentary rocks are broadly folded in a northwest trending anticline whose axis cuts the northeast corner of Spieden Island. The contacts between the Spieden Formation and both the Upper Triassic Haro Formation to the south and the Upper Cretaceous Nanaimo Formation to the north are covered by water, but structural relationships indicate they probably are faults.

121

Wiedemann, A.M. Ammophila arenaria (L.)Link and the natural stabilization of coastal sand dunes. The Evergreen State College

Ammophila arenaria (L.)Link was introduced along the northwest Pacific coast in the early 1900's. Its rapid spread, both naturally and by planting, has resulted in the development of a massive foredune system on coastal dune areas. This foredune acts as a barrier to the inland movement of sand. A deflation surface, rapidly covered by vegetation, lies to the lee of the foredune and widens as the available sand is blown inland. The response of A. arenaria to variable sand burial will result in a gradual widening of the foredune which will be colonized by shrub and tree species from the deflation plain. Decreased sand activity on the high dunes inland will result in establishment of pioneer vegetation and the eventual development of a regional climax forest.

122

Quinn, Robert R. NOCTURNAL AIR STRATIFICATION IN A SMALL SCABLAND BASIN, Eastern Washington University

In the early evening of November 13, 1975, a study of low level air temperature stratification was undertaken in a small enclosed basin seven miles south of Cheney, Washington. Clear skies and calm winds permitted rapid radiational cooling of the surface resulting in low level air drainage and strong surface temperature gradients. The low level air temperature distribution was altered by vegetation barriers and zones of standing water, but slope winds did effectively flow through vegetation barriers within a few feet of the surface.

123

Wotruba, Nancy FLUID INCLUSION THERMOMETRY, METALINE MINING DISTRICT, WASHINGTON
Department of Geology, Washington State University

Thinned sections of quartz, sphalerite, calcite, and dolomite from lead-zinc deposits in carbonate breccias of 19 properties in the Metaline Mining District, Washington, contain both primary and pseudo-secondary fluid inclusions. They range in size from 1 to 500 microns and contain no daughter minerals. Fluid inclusion homonogenization temperatures are as follows: Sphalerite and quartz, 140° to 230° C, averaging 180° C; dolomite 135° to 210° C, averaging 165° C.; and calcite 100° to 175° C. averaging 125° C. The range of temperature of homogenization is similar regardless of whether the minerals are from the Josephine or Yellowhead horizon. There is no significant temperature variation between properties. The temperatures are within the range commonly found for lead-zinc deposits of the Missippi Valley type.

124

Rosgoe, R. T.
ANCIENT LAKES OF THE COLUMBIA RIVER - ICE-DAMMED AT HIGH LEVELS
13328 - 30th Avenue NE, Seattle WA 98125

Penultimate glaciation was the most extensive thruout world. Ice dammed Columbia River at Ranier OR(R) and White Salmon WA(WS). Glacier at (R) may have been from Cowlitz valley or Puget Lobe; at(WS) it was from only West Fork Hood River. Prominent beaches require rock spillway, ice abutting, so water does not flow on ice, melting it. Mostly ohrome-yellow clay beaches and terrace fills near streams, with ancient weather patterning, were traced extensively- beach level usually varied negligibly from topographic map contours. Rock spillways were located for all beaches. Beach elevations ((dam location), ft.): (R)285,400,670;(WS)870, 1150-3060(prominent stands: 1750,2000,2300, 2800).125 varves counted in 285 ft. beach terrace fill. 670 ft. beach overlaps the 870 ft., so non-contemporaneous. Beaches should be evolution-museum(pollen, etc.) at ca. $4X10^4$yrs.ago.

125

Stronck, David R. SOME ATTITUDES AND REACTIONS TO DECLINING ACHIEVEMENT IN HIGH-SCHOOL SCIENCE
Washington State University

To investigate some of the attitudes toward the decline of students' performances in high-school science courses which has been reported by national standardized tests, a questionnaire was completed by 25 high-school science teachers, 27 science majors in upper-division courses at W.S.U., and 69 non-science majors in a freshman course at W.S.U. All groups agreed that high-school grade point averages are no longer reliable indexes of academic achievement. The teachers recommend a greater use of standardized tests while both groups of students opposed such tests. All groups recognized that high-school science courses are valuable preparation for college. The groups did not find the teachers much concerned about the success of their graduates in college courses. All roups agreed that the universities should depend more upon entrance examinations on the achievement of basic skills.

126

Stronck, D. R. and McNew, L. D. AUTO-TUTORIAL COURSES FOR ACADEMICALLY WEAK STUDENTS
Washington State University

At W.S.U. there is an increasing trend in the percentage of academic deficiencies especially among new students. At least 1,000 academically deficient students per year are not identified as potentially weak students through their scores on the Washington Precollege Test or high-school G.P.A. or any other criteria available to the counselors and the advisors. Approximately ten percent of the undergraduate students drop courses before the middle of each semester. These students seem to need intensive short courses provided in the later part of each semester and emphasizing alternative modes of instruction, i.e., mastery learning through (1) a study-skills module appropriate for each course, (2) auto-tutorial self-paced modules, (3) tutoring, and (4) peer-mediated instruction. Computer generated questions can increase the rate of feedback to students.

127

Panel Discussion: Using Computers and Pocket Calculators in the Mathematics Classes

Moderator: Gail Williams, Professor of Mathematics, University of Idaho

Panelists: Dale McDonald, Teacher, Hamlin Elementary School, Spokane
"The uses of pocket calculators in the elementary school"

Gene Sievertson, Teacher, Lewis & Clark High School, Spokane
"The uses of pocket calculators & computers in junior and senior high school"

Stan Robinson, Professor of Mathematics, Eastern Washington Univer.
and
Gary Breneman, Professor of Chemistry, Eastern Washington Univ.
"The uses of on line computers in the high school"

Dave Barnes, Professor of Mathematics, Washington State University,
"Using the pocket calculator in the calculus classroom"

128

Becker, W.A. SIX YEARS EXPERIENCE WITH INNOVATIVE LEARNING METHODS IN A UNIVERSITY GENETICS COURSE
Washington State University

General Genetics is a 3-semester-credit, junior level university course taught by the audio-tutorial method; twenty mini-courses each consisting of objectives, text, study guide and a self test; student tutors selected from previous classes on basis of excellent performance; computer random generated examinations from a test bank of over 2,300 questions; learning for mastery at the 80% level with weekly deadlines for each minicourse; Scientific American Offprint essay tests with a random choice of questions (roll of a die) and differential rewards grading system involving points for each course item.

Student evaluations indicate students spend less time and learn more material of higher quality than in a comparable lecture science course. The failure rate on minicourse tests was 15-20% at the 80% mastery level with much higher failure rates at the 90 and 100% mastery levels.

129

Stronck, D. R. THE ASSUMPTIONS GOVERNING THE RESPONSES OF THE ENERGY-ENVIRONMENT SIMULATOR
Washington State University

Citizens' Workshops on Energy and the Environment are supported by the U. S. Department of Energy. Participants in such workshops get a chance to try their hand at solving some of the energy-environment problems facing the nation today by using an Energy-Environment Simulator. The Simulator is a specially designed analog computer into which are programmed energy resources, energy demands, and environmental effects. Participants operate the controls to avoid the disaster of exhausting the supplies of fossil fuels. The goal of this environmental game is to continue the counting of years before a shortage of fuels causes disaster. Participation in this game will be most intelligent when the participants understand the assumptions governing the responses of this analog computer. Settings of this computer can be changed to simulate a different set of world conditions.

130

Tripard, G. E. THE ENERGY-ENVIRONMENT SIMULATOR IS A BAD MODEL
Washington State University

The Energy-Environment Simulator according to the Department of Energy is a specially designed analog computer that simulates real-world conditions. The simulator is based on a model of the world which is bad and in fact positively misleading. The model employs numerous false assumptions which lead to erroneous conclusions about reality. In fact the crucial relationship between supply and demand is entirely misrepresented.

201

Ellinsworth, Sue
[illegible] CHEMISTRY [illegible]
Washington State University

The major assumption: Some principles in the traditional high school chemistry course can be taught in the natural environment for increased relevance to the students.

Support for assumption is as follows: slides of outdoor lab exercise, summary of desired experiment characteristics, examples of useful outdoor labs, statement for applied teaching and a source listing for information and experiments.

202

Meredith, Eloise, and Alison Nicholson,
THE ENVIRONMENTAL STORY BOX, University of Victoria

The Environmental Story Box is an aid for developing environmental attitudes at the primary grade level. Included in the box is the story "Earl the Earthworm" which stresses the interrelationships of the natural world. Also in the box are stuffed characters and masks for a visual presentation which can actively involve the children. The impression created through participation is hoped to encourage creative art, writing and acting, develop personal communication and to increase environmental awareness.

203

Mitchell, C.C. and J.H. Schomaker. WILDERNESS TRAVEL SIMULATION MODELING AS AID IN EDUCATION
College of Forestry, Wildlife and Range Sciences, University of Idaho

The U.S. Forest Service has developed a GPSS computer model to simulate hiker and horse party use in wilderness areas. The model has been converted into the more readily available GPSS 360. A user's manual explaining the model has been written for use in wilderness and resource management courses at the University of Idaho. The manual and model are intended to be used as an educational tool to better educate students interested in wilderness management. The Eagle Cap Wilderness, Oregon, is used as an example in the manual to add realism to the simulation. The educational exercise consists of students becoming familiar with the model through simple examples and then changing conditions in the model to reflect possible management strategies. The students then evaluate the impact of the proposed strategies on the visitors' wilderness experience. The manual and program will be available for use by other interested educational institutions.

204

[illegible] SOCIOLOGY OF SEX DIFFERENCES
[illegible] Washington University

[illegible] trends in the social and sexual relationships between men and women and the [illegible] of the feminist movement have [illegible] interest in the differences which exist between males and females. The issue of whether sexual differences are primarily biological in origin or the result of socialization is the source of much debate and controversy.

131

CURRENT POSSIBILITIES IN CAI - G. A. Gerhold, L. Kheriaty, M. Davidson, Western Washington University

There are two important, and in some sense opposing, trends in applications of computers to instruction. As authors gain experience in writing CAI materials, they make increasingly sophisticated demands on the systems software. On the other hand, if a user can make do with a microcomputer, then the cost of the system is very low (≈ $3000). We will describe a composite system in which a minicomputer is used to create CAI materials and a microcomputer is used to deliver CAI materials, thus maintaining both sophistication and low delivery cost. The microcomputer system will be demonstrated.

132

Panel Discussion: Using Computers and Pocket Calculators in the Mathematics Classes

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and
Gary Breneman, Professor of Chemistry, Eastern Washington Univ.
"The uses of on line computers in the high school"

Dave Barnes, Professor of Mathematics, Washington State University,
"Using the pocket calculator in the calculus classroom"

133

Henscheid, L.G., Spitzer, K.D., IS PREPARATORY CHEMISTRY SUCCESSFUL? Washington State University

The Chemistry Department at WSU offers a 2 semester credit nonlaboratory course, Chem 104, for students with poor mathematical and chemical skills. The course is designed for science majors who wish to enter Chem 105, General Chemistry for Science Majors, because of their career ambitions but performed poorly on the Chemistry Placement Exam. Chem 104 is taught autotutorially with computer generated multiple testing for mastery learning. The success of Chem 104 has been examined by following the progress of students who have completed Chem 104 in the sequential course Chem 105. The data indicates that Chem 104 is a successful solution to the needs of these students.

134

Crosby, G. A. TAKING ADVANTAGE OF A REVOLUTION: POCKET CALCULATORS AND EXAMINATION FORMAT, Washington State University

For teaching in the physical sciences the availability of pocket calculators is opening new vistas for problem solving and the use of problems to exemplify concepts. In short, more meaningful homework can be assigned, since the tedium of computation has been largely removed. For examinations, however, the reliance of students on pocket calculators is creating problems for test writers. Some old style questions are useless. Others tend to trick the modern student although they were once perfectly legitimate for BC students. The author has tried a new format for examinations in freshman chemistry to attack the age-old problems of student avoidance of homework and our inability to grade it and, simultaneously, to capitalize on student reliance on hand calculators. Advantages, disadvantages, and statistical data on student acceptance will be discussed.

135

Stradling, Dale F. THE SCIENCE CURRICULUM IN EARLY WASHINGTON STATE HIGH SCHOOLS. Eastern Washington University

During the late 1800's and early 1900's two semesters of physical geography in grade nine and physics in grade twelve tended to be the most important offerings and were generally taken by all enrolled students. Additional courses of either one or two semesters included physiology, botany, zoology, and chemistry.

Consistent with national trends, general science largely replaced physical geography by the 1920's and biology replaced physiology, and in some schools it also replaced botany and zoology by the mid-1930's. With a few notable exceptions, the sequence of 9th grade general science, 10th grade biology, 11th grade chemistry and 12th grade physics had become established by the mid-1930's.

136

Davis, J.A. HELPING IMPROVE UNDERGRADUATE LEARNING: Programs at Sixteen Universities
Washington State University

Established instructional improvement programs at sixteen universities were visted. Their directors, staff, and participants were interviewed, and their impacts upon their institutions assessed. The investigator reviewed each program's effects upon its institution's academic programs, courses, students, faculty, and university policies. The extent to which the instructional improvement programs were "institutionalized," their internal stability, and self-assessments of their effectiveness, were examined. This report summarizes the findings on campuses from Florida to Oregon, with particular attention to instructional improvement in science-related programs.

137

Ripp,M.L. and Hoffman,J.E. RELATIVE VALUE OF WATER RELATED OUTDOOR RECREATION ACTIVITIES
College FWR, University of Idaho

During the summer of 1977 visitors to a northern Idaho state park were asked to compare each outdoor recreation activity against all other activities on a paired basis and to indicate which one of the pair provides greater value or enjoyment. This paired comparison method, first developed by the sociologist Thurstone in 1927 as part of his law of comparitive judgements, provides a means of scaling items along a value continuum. From the information obtained from visitors, each activity will be placed on a continuum and the distance between the location of activities on the value continuum is a measure of relative value. More effective management alternatives for this recreational resource can result from this research and the methodology is applicable for research at other outdoor recreational facilities.

138

Tremblay,Jr., K.R.; Dillman, D.A.; Dillman, J.J. AN EMPIRICAL ANALYSIS OF HOUSING PREFERENCES Washington State University

It is generally assumed the desire of Americans for homeownership transcends divergent segments of the population. Previous preference surveys have not considered the relationships between socioeconomic status and housing preferences. Theoretical reasoning suggest relationships, and to assess such a possibility a state wide sample of Washington residents was surveyed. Regression analyses of the resulting 2,801 response forms does suggest the degree to which the single-family home ownership preference is held varies according to socioeconomic status. As expected, the single-family housing situation is the preferred housing choice by a wide margin.

139

Rogers, C. T. THE PRE-PARADIGM STATE OF CURRENT ELECTORAL THEORY
Montana College of Mineral Science and Technology

Electoral theory treats problems with elections Topics in electoral theory are pursued in two ways. One of these is the older fashion of electoral systems, sets of rules concerning the conduct of elections. This amounted to practical art more than to theory, but there were (are) champions of one among the systems as opposed to others. The modern manner is by means of social choice theory pursued in a formal (mathematical) fashion. These approaches are not distinct, for they appeal to the same examples and problems, but neither of them is sufficient in their present state.

It is argued that this is a Kuhnian "pre-paradigm state of affairs, and that this must be remedied before electoral theory can be properly founded and developed.

140

Padilla, F.V. The Development of State Science Policy.

Washington State University

States appear slow and hesitant in organizing, supporting and encouraging an integrated approach to state science policy, planning priorities and criteria for same. NSF has encouraged states to create state science advisory units and identify state science advisors. To date the results have not been encouraging. Two studies conducted at five year intervals reveal that state science advisory units have confused and contradictory aims, state science advisors perform no coherent set of tasks, and conse-science policies.

141

Quddus, Muhammed A.
PHYSIOLOGY OF POLITICAL ATTITUDE: SOME THOUGHT
University of Idaho

The purpose of this paper is to cogitate about some possible links between physiological condition of an individual and his political attitude. Contrary to the present state of Social Science knowledge that political attitude is shaped by socio-cultural environment alone, this paper contends that physiological condition, defined particularly (but not solely) in terms of nutritional status, has some identifiable role to play in shaping a person's political attitude. The influence of socio-cultural environment is not denied, however. This research concerns the general hypothesis that a malnourished person's political attitude will be different from his nourished counterpart.

142

Chermak, Gail D., Types of Presbycusic Etiologies and Associated Audiometric Patterns, Dept. of Speech, Washington State University, Pullman, WA 99164

This paper presents an overview of the histological, electrophysiological, and behavioral evidence supporting various types of presbycusic etiologies and resulting audiometric findings. Types of inner ear conductive presbycusis (mechanical presbycusis) are expanded upon. Predictable relationships between site of lesion, presbycusic etiology, and audiometric findings are presented through case presentations.

143

Lord, J. B. THE DISTINCTIVE ACOUSTIC FEATURES AS A PROSODIC FUNCTION
Washington State Univ.

The very high degree of contrast between normal distribution of distinctive acoustic features in ordinary speech, and that found in much poetry, demonstrates convincingly if not conclusively, first, that poets use their prosody to exploit the redundancies of natural language to enhance the information load of ordinary language in order to make poetry of it, and second, that the distinctive acoustic features are a psychologically valid phenomenon.

144

The Development of a Comprehensive Speechreading Test
Gail Chermak, Ph.D., Asst. Prof., WSU, Pullman, WA.
Mary Ellen MacDonald, Southern Illinois University

The purposes of this study were: 1) to develop the Comprehensive Speechreading Test with three forms suitable for administration in the visual, auditory, and combined auditory-visual modes, and 2) to assess this instrument's equivalent forms reliability. Each form (A,B,C) was composed of 20 sentences selected, using a stratified randomized procedure, from the CID Everyday Sentence Lists (Davis and Silverman, 1970). Twenty-seven normal hearing college age adults served as subjects. Order of experimental conditions was counterbalanced to control for learning and practice effects. Analytic (one point per syllable correct) and synthetic (one point if 70% of the key words were correct) scoring was utilized. Pearson product-moment correlations were utilized to assess the equivalent forms reliability of this instrument. Seventeen of the 18 correlation coefficients were significant.

146

Burke, David J.
The Supreme Court and the First Amendment: An Empirical Analysis (1953-1976)
Dept. of Political Science, Wash. State Univ.

This paper attempts to quantify the Warren and Burger Courts treatment of First Amendment cases. The entire Court and individual justices are scored on a liberal/conservative scale. Subcategories of free expression are analyzed. Bloc analyses for all cases and for selected subcategories of free expression are also presented. Finally, a time series analysis is performed in order to predict future trends on First Amendment cases.

147

Bibliotherapy in Audiological Habilitation
Gail Chermak, Ph.D., Asst. Prof., Speech Department, Washington State University, Pullman, WA 99164

Bibliotherapy (the use of readings as therapy) as been advocated by several individuals (Dreher and Bates, 1973; and Chermak, 1976); however, the use of this technique has been limited to specific clinical instances. The present report focuses on the potential broader application of bibliotherapy. Bibliotherapy may be incorporated in speech, language, voice, and audiological diagnostic sessions, rehabilitation efforts with adults and parents of involved children, hearing aid evaluations/fitting sessions, and public communication disorders screening and information clinics. Specific applications will be described and supported drawing from theoretical foundations.

148

David W. McClain LEGAL AND INSTITUTIONAL CONSTRAINTS ON GEOTHERMAL DEVELOPMENT IN THE NORTHWEST
Oreg. Inst. Tech.

There is a large potential for geothermal development in the Northwest which cannot be utilized because of legal-institutional constraints. Such constraints should be reviewed and examined in relation to the developmental potential for the region. There are policy implications to be considered as attempts are made to relax or remove these constraints. Thought must be given to the physical, economic, and social impacts of changing the legal-institutional constraint set and the alternative---do nothing.

149

Utter, Jack & McCool, Stephen F. RIVER RECREATION USE ALLOCATION: THE BASIC ISSUE University Of Montana

If one accepts the concept of use limitations on wild rivers or wilderness lands then the question must be faced as to which people get to use the restricted environment when the number of potential users exceeds the use limit. This, in general, is the "use allocation issue". Use limits are a generally accepted way of life in America, as typified by golf courses, sporting events and other activities. With certain natural resource situations, however, controversies have developed regarding inequities in agency programs to allocate use. The conflict has become most heated between commercial and non-commercial recreational use of the nation's principal whitewater rivers. After several years of ploy and counter-ploy the time has arrived in which formalized investigations should be made into these general issues.

150

Olen P. Matthews MINING LAW & WESTERN WATER RIGHTS: OR HOW TO STAKE A CLAIM ON WATER University of Idaho

A recent U.S. Circuit Court decision has added an additional cloud to a State's right to regulate water within its boundaries. In this decision water was considered a valuable mineral and subject to the Federal Mining Law of 1872. If this means a claim can be staked on water then existing Western water law will be disrupted.

151

McGuire, John F. - Society and Technology
Montana College of
Mineral Science and Technology

Technology consists of the materials and tools of production, but it also requires an accompanying social technology in order to organize people to get work done. In this way, machine technology interacts with society and involves what a society values and what choices it makes. However, critics of technology argue that technology controls man and thus has become its own end. The fallacy of such an argument is its failure to emphasize man's ethical use of technology as a means to a human end. Thus, responsible use of technology ultimately depends on man's creativity which forms the very foundation of his nature as man.

152

Schipf, Robert G. SCIENTIFIC MISINFORMATION AND FRAUD IN POPULAR MEDIA.
University of Montana

Much of the mass media is anti-science and anti-technology, in effect if not always in intent. Much misinformation, either through misinterpretation of scientific data or through deliberate distortion and/or lying, is published in newspapers and popular magazines. Scientists who immediately send letters or papers to scientific journals to refute erroneous published material rarely care to address the editors of popular serials even though distortion or fraud in such places may be of much greater import because of attempts to influence legislation or popular action. Although practicing scientists occasionally perpetrate fraud, much such activity is done by laymen who imagine themselves to be scientists. I believe that it is the duty of scientists, especially those in academe, to immediately and strongly correct untrue statements in the popular media, even when their colleagues are guilty.

153

Breuer, D. W., and D. W. Johnson. EFFECTS OF UREA FERTILIZATION AND REFERTILIZATION ON NITROGEN FRACTIONS OF A FOREST SOIL. University of Washington.

An aerobic soil incubation technique was combined with field studies to examine the effect of added urea on inorganic and several organic fractions of soil nitrogen. Variables considered included rate of urea addition, time since fertilization, and rate of previous fertilization. The relative rates of mineralization, immobilization, and nitrification, and consequently the quantity of plant-available nitrogen following fertilization varied according to previous treatment of the study soil. The proportion of nitrification due to heterotrophic vs. autotrophic organisms was assessed.

154

Vogt, D. J, and R. L. Edmonds, POTENTIAL INHIBITION OF NITRIFICATION IN DOUGLAS-FIR, University of Washington

During July, 1976, and January, 1977, ammonium and nitrate levels in the litter and soil (0-5cm) were determined in two Douglas-fir (Pseudotsuga menziesii) stand ages (75 and 175 years old) and in two different site qualities (site classes II and IV) in the Pacific Northwest. The ammonium and nitrate values were converted to a "nitrification ratio" i.e. $[NO_3/(NH_4+NO_3)] \times 100$. The nitrification ratios for the high site quality (II) stand increased from the 75 to the 175-year-old stand in both the litter and soil during both sampling periods. However, the ratios for the low site quality (IV) stand decreased from 75 to the 175-year-old stand. Thus, there appears to be some inhibition of nitrification occurring in the low site quality, older age stand.

155

Kirkham, R.R., A. S. Baker MOVEMENT AND RETENTION OF NPK FERTILIZERS IN COLUMBIA RIVER DREDGE SPOIL Washington State University

Spoil from channel dredging in the lower Columbia River presently is being deposited on existing islands and tidal influenced low lands. Such sandy areas are excellent sites for the creation of marsh habitat. A proper fertilizer program is of extreme importance to the success of early marsh establishment. A typical spoil deposition site, Miller Sands, was monitored for a two-month period to assess fertilizer retention for areas subject to daily tidal innundation. A short-term chloride mobility experiment also was conducted to simulate nutrient movement in the spoil. Fertilizer management suggestions have been formulated from these results.

156

Vogt, K. and R. L. Edmonds, NUTRIENT ACCUMULATION IN BASIDIOMYCETES, University of Washington

Basidiomycete sporocarps were collected, identified, and analyzed for N, P, Ca, K, Mg, Mn, Fe, Na, and Zn content in a 13 and 95-year-old Douglas-fir stand, 40-year-old red alder, 85-year-old western hemlock, and 175-year-old Pacific silver fir stands in Seattle's Cedar River Watershed. The sporocarps (cap and stalk) accumulated N, P, K, and Mg in higher concentrations than the forest floor from which they were removed indicating accumulation of these elements in all ecosystems. Fruiting bodies of different species from the same ecosystem have a wide variability in nutrient accumulation. Ranges of nutrient contents were 0.66-11.27% N, 0.042-2.394% P, 7-90,443 ppm Ca, 2,975-57,404 ppm K, 10-7096 ppm Mg, 3-1727 ppm Mn, 15-3975 ppm Fe, 18-6763 ppm Na and 15-278 ppm Zn. Basidiomycete sporocarp biomass production was less in the 13 year (0.84 kg/ha)Douglas-fir stand than in the 95 year (11.0-15.8 kg/ha) stand.

157

Miller; J.R., H. L. Gibbons and W. H. Funk PRACTICALITY OF CONTINUOUS FLOW MEASUREMENT OF IN SITU CHLOROPHYLL A FLUORESCENCE, Washington State Univ.

Continuous flow measurement of in situ chlorophyll a fluorescence was evaluated using a Turner Model #10-005R Field Flurometer and the trichromatic method of chlorophyll a determination. Chlorophyll a was measured in the Lower Granite Reservoir-Snake River, a mesotrophic flow-through system, and in Liberty Lake, a highly eutrophic lake in eastern Washington. In situ measurement of chlorophyll a was found to be applicable for the less productive Snake River Reservoir and relatively inaccurate on the highly productive Liberty Lake.

158

Larson,D.W. RESERVOIR TEMPERATURE AND TURBIDITY SIMULATIONS VERSUS OBSERVED FIRST-YEAR WATER QUALITY CHARACTERISTICS OF A MAJOR IMPOUNDMENT ON THE ROGUE RIVER,OREGON. Dept.Biology,Portland State Univ.

Mathematical models were used to predict temperature and turbidity regimes in recently completed Lost Creek Reservoir Project on the Rogue River in Oregon.

Following closure of the dam in February,1977, studies were initiated to characterize the developing limnology of the new reservoir,and to monitor the Rogue River downstream of the project to determine how and to what extent the water quality of this famously pristine river was affected by water released from Lost Creek Reservoir.

Results of reservoir and discharge simulations are compared with post-impoundment water quality data to assess reliability and usefulness of modelling program.

159

Beckwith, M.A. and R.A. Soltero. PHYTOPLANKTON RESPONSE TO NUTRIENT INACTIVATION/PRECIPITATION BY ALUM IN EUTROPHIC MEDICAL LAKE, WASH. Dept. of Biology, Eastern Wash. University, Cheney, WA. 99004

A lake restoration project by application of 1031 tons of liquid aluminum sulfate was carried out on Medical Lake, WA to reduce nuisance algal blooms by phosphorus inactivation/precipitation. This paper will present the response of the phytoplankton community to that treatment. Preliminary results indicate that the application has substantially reduced phosphorus levels, decreased phytoplankton standing crop, and has resulted in a phytoplankton species shift.

160

Keizur, R.G., and R.A. Soltero. RESPONSE OF THE ZOOPLANKTON COMMUNITY OF MEDICAL LAKE, WA. TO AN APPLICATION OF ALUM. Department of Biology, Eastern Washington University, Cheney, Wa. 99004

During the months of August and September 1977, Medical Lake,Wa. underwent a whole-lake application of 1031 tons of liquid aluminum sulfate. This paper will discuss the response of the zooplankton community to that treatment. Preliminary findings indicate that the community was not directly affected by the application. However, changes in the chemistry of the lake and the phytoplankton community as a result of the application appear to have influenced the dynamics of the zooplankton community.

161

Wosika, E.P. and C.S. Yee TERRESTRIAL STEREOPHOTOGRAPHY - A VALUABLE ILLUSTRATIVE TOOL FOR WATERSHED SCIENTISTS AND MANAGERS Humboldt State University

The use of three-dimensional photographic illustrations in reports can be a valuable interpretive tool. Geologic structure, topographic conditions, and other factors can often be more realistically presented in research and environmental impact reports. This paper presents proven technique and equipment guidelines for producing high quality terrestrial stereophotographs suitable for use in reports by watershed specialists.

162

Spittlehouse, D.L, and T. A. Black MEASUREMENT OF FOREST EVAPOTRANSPIRATION WITH THE BOWEN RATIO AND EDDY CORRELATION METHODS University of British Columbia

Measurement were made of the latent and sensible heat fluxes above a 15-m high Douglas-fir forest on the southwest coast of British Columbia. The Bowen ratio system used reversing diode psychrometers and the eddy correlation system used Gill anemometers mounted horizontally and at 30 degrees from the vertical and a fast response thermistor. Spectral analysis of the eddy correlation data indicated a large low frequency component. Difficulty was experienced in obtaining adequate eddy correlation data due to the generally low windspeed above the forest causing the anemometers to stall. A regression of the sensible heat fluxes, eddy correlation (H_E) on the Bowen ratio (H_B), gave $H_E = 0.925\ H_B + 27.0\ W\ m^{-2}$, $R^2 = 0.888$, $S_{y-x} = 43.8\ W\ m^{-2}$. The experiment suggests that an eddy correlation system using mechanical anemometers is not suitable for extended water balance studies of forests where low windspeeds predominate.

163

Dosskey, M.G. and T.M. Ballard. EFFECT OF SOIL TEXTURE ON WATER UPTAKE BY DOUGLAS-FIR SEEDLINGS. Faculty of Forestry, Univ. of B.C., Vancouver, B.C.

The effect of soil texture (silty clay, silt loam, and loamy sand) on water uptake was studied on potted Coastal Douglas-fir seedlings. Water potential was measured in soil and needles with dew-point hygrometers. Rates of water uptake by seedlings were calculated from gravimetrically determined evapotranspiration fluxes. Flux resistances between soil and needles were calculated using the Ohm's Law analogy. Water uptake rates appear to be highly influenced by soil texture in relatively dry (-1 to -3 MPa) soil, where unsaturated hydraulic conductivity is indicated as the limiting factor. Thus water retention energy alone may be an insufficient indicator of water availability to tree seedlings.

164

Edmonds, R.L., RELATIONSHIPS BETWEEN STAND PRODUCTIVITY, STAND AGE, LITTER DECOMPOSITION AND NUTRIENT RELEASE IN DOUGLAS-FIR, Univ. Of Washington

Litterbags containing Douglas-fir needles were placed in a sequence of Douglas-fir stands ranging in age from 11 to 97 years in the Cedar River Watershed, Washington. Loss of weight, cellulose, lignin, N. P, K, Ca, Mg, and Mn were determined after two years. Decomposition rates increased until age 24, then decreased. Using stepwise multiple regression analysis, the correlation coefficients for stand productivity and (a) N loss alone (b) N + K loss and (c) N + K + Mg loss were 0.73, 0.96, and 0.98, respectively.

165

Grier, C.C. and T. M. Ballard, SOME ALPINE COMMUNITIES OF THE KLUANE RANGE, YUKON: BIOMASS, NET PRODUCTION DISTRIBUTION, University of Washington and University of British Columbia

Net primary production and biomass and nutrient distribution were determined for some alpine plant communities of the Kluane Range, Yukon Territory. Communities appeared to be at or near steady state biomass accumulation. Organic matter accumulation ranged from 2.1 to 51.1 kg/m^2; plant biomass ranged from 183 to 1350 g/m^2. Primary production ranged from 22 to 173 g/m^2. The major factor influencing production appeared to be the depth of winter snow cover.

Soils were derived from wind or ice transported, calcium carbonate-rich parent materials. Soil pH ranged from about 6.0 to 8.3 and commonly exceeded 7.0. Nutrient accumulations in vegetation reflected the calcareous nature of the soil parent material.

166

Keyes, M. R., FINE ROOT DYNAMICS IN DOUGLAS-FIR AS RELATED TO SITE INDEX, University of Washington.

Fine root (<2mm) dynamics in 40-year-old, site class II and IV, Pseudotsuga menziesii stands were examined by periodic soil coring and use of root observation windows. Results of coring showed large seasonal variation in fine root biomass in the site IV stand but only small variation in the site II stand. Peak fine root biomass (6.3 t/ha) in the site IV stand occurred in late spring; the low value (1.9 t/ha) occurred in late summer. In contrast, fine root biomass in the site II stand averaged about 2.0 t/ha throughout the year.

Data from observation windows showed peaks in fine root activity in spring and fall. The timing and magnitude of these peaks differed. Observed peak root activities occurred one month later in the site II stand than in the site IV stand. Under favorable conditions, the site IV stand produced more new fine roots while sustaining more older root growth.

167

James, M. E. ROCK WEATHERING IN THE CENTRAL WESTERN CASCADES. University of Oregon.

Rock weathering studies were conducted on three volcanic formations which compose the major part of the western Cascades structure in Oregon. Soil to bedrock profiles were analyzed by XRF and XRD to observe chemical and mineralogical changes during rock weathering. Parent materials included ash-flow tuff and airfall ash breccias, andesitic and basaltic flow rocks and glacial till. Primary internal constraints on rock weathering appeared to be initial bedrock texture, density and mineralogy. Sample sites ranged from 360 m to 1550 m elevation. The presence of a thick snowpack in winter was found to be correlated with podzolization.

168

Eleling, J. M. SIGNIFICANCE OF TURBIDITY IN WATER QUALITY, Washington State University

Over the past years, turbidity data has been employed in quantifying water quality in a wide range of disciplines, most notably in the relationship to suspended sediment concentrations. Normally an empirical relationship is derived by the investigator by analyzing field data and laboratory measurements. By approaching the problem from an instrumental and theoretical view, the turbidress of their results can be explained and the uses, misuses, limitations of the technique cleared up.

169

Beschta, Robert L. THE INTRUSION OF FINE SEDIMENTS INTO A GRAVEL BEDDED STREAM, School of Forestry, Oregon State University

Results of a study conducted in southwestern Washington indicated that the rate of sediment transport and particle size of transported sands are the most important variables in defining the rate and extent of intrusion of sands into a gravel bedded stream section. Either an increase in the rate of sediment transport or a decrease in the size of the transported sands resulted in an increase in the extent of intrusion of sand into the gravel bed. Hydraulic variables such as depth and velocity of flow also affected the rate and extent of intrusion, but less significantly than sediment size and rate of transport.

170

O'Leary, John F. STREAM FLOW MEASUREMENT IN FINE GRAVEL: AN IMPROVED WATER SAMPLER FOR THE OREGON COAST RANGE, School of Forestry, Oregon State University

In the past researchers have used empirical, analytical and field methods for the determination of bedload transport. This study uses a vortex sampler for measuring rates and total yields of bedload sediment. Description of the vortex installation as well as the initial results of this two year study will be presented.

171

Merwin, L.A. and W.E. Miller NUTRIENT LIMITATION STUDY OF THE BIG WOOD RIVER IN SITU CHANNELS AT KETCHUM, Idaho USEPA, CERL

The Algal Assay Procedure:Bottle Test (AAP: BT, USEPA, 1971) was used to determine the nutrient limitation of in-situ channels in the Big Wood River adjacent to the Ketchum, Idaho Sewage Treatment Plant. The local, short term effects of increased nitrogen loadings on the Big Wood River were investigated. Growth potential relationships between the use of laboratory chemical analysis and the AAP:BT growth responses showed that all sites were primarily limited by phosphorus. The AAP:BT as an alternative to on site bioassessment techniques was shown to be cost beneficial in nutrient assessment evaluation.

172

R. E. Austin, T.Shiroyama, J.C. Greene & W.E.Miller BENTHIC INVERTEBRATES, FIRST ORDER STREAMS & FOREST HARVESTING PRACTICES, USEPA, CERL, Corvallis, OR

In the summer of 1976, aquatic macroinvertebrates were collected and analyzed from first order streams which drained watersheds reflecting different forest harvesting practices. These data were evaluated to determine what effects harvesting had on the associated invertebrate community. The stream draining a shelterwood-cut watershed produced the least total number of invertebrates, with diversity being quite stable. The stream draining a watershed containing small clearcuts totaling 30% produced the greatest total number of organisms collected but with decreasing diversity. The total clearcut watershed stream produced statistically the same total number of organisms collected as the control but with the diversity increasing.

174

Berene, D. M. SURFACE WATER QUALITY IN THE PALOUSE DRYLAND WHEAT REGION AND A PREVIEW OF SOME CURRENT MINIMUM TILLAGE RESEARCH Washington State University

Surface water quality in the Palouse region is detrimentally affected by the agriculture of the area (up to 20 tons per acre per year of soil loss) and by the two major municipalities of the region, Moscow and Pullman. Surface water quality was determined using nutrient and coliform parameters. Rural sources of contamination were predominant during high flow (winter month periods) while urban sources were often predominant during periods of low flow. Minimum tillage is being considered in the minimization of agricultural pollution. A preview of current research with minimum tillage concerning surface residue management and water quality will be presented.

176

Novak, M.D. and T.A. Black THE EFFECT OF DRAINAGE AND TILLAGE ON THE THERMAL REGIME OF A BARE MUCK SOIL IN EARLY SPRING University of British Columbia

The experiment was conducted on Lumbum deep muck soil in Surrey, B.C. and was split into two distinct time periods. The first lasted from April 22, 1977 to May 8, 1977 at which time plowing, discing, and seeding occurred, and the second lasted from May 15, 1977 to June 8, 1977. In the pre-plowing period temperature profiles, soil heat flows, soil moisture contents, and bulk densities were monitored continuously at both poorly and well drained sites. In the post-plowing period the above parameters were monitored between the corn seed rows and in the tractor tire tracks. Preliminary analysis of the results indicates that both the surface energy balance and the soil thermal properties are critical in determining the soil thermal regime. The results will be presented and discussed in detail.

178

McCool, D.K.[1], M.J.Robinette[2], and Myron Molnau[3] RAINDROP SIZE DISTRIBUTION IN THE PALOUSE
[1]USDA, Agricultural Research Service, Pullman, WA, [2]Washington State University, [3]University of Idaho

Rainfall intensities in the Palouse are generally quite low as compared to other areas of the U.S. Knowledge of the intensity/drop size relationship is necessary for determining the erosive potential of typical storms and for design parameters for rainfall simulators. This paper presents the results from a drop size and intensity study at Pullman, WA and the methods for producing drops for calibration purposes. Production of uniform drops of less than 1 mm diameter was the major obstacle in the study.

177

Bassett, D. L. and C. E. Kaiser. FACTORS AFFECTING THE CLOGGING OF MICROTUBE EMITTERS IN TRICKLE IRRIGATION
Agr. Engr. Dept., Washington State University

Clogging of emitters remains a major deterant to the widespread use of trickle irrigation in the Northwest. This paper summarizes a study of factors affecting the clogging of microtubes, one of the family of long-path emitters. In this study conducted at the IAREC, Prosser, WA, the rate of clogging of over 200 emitters was observed as they discharged water under various design and management conditions. Results suggest the use of flow conditions that insure a high Reynolds number and turbulent flow in the microtube retards clogging and enhances the passage of impurities through the system.

175

Young, J.L. and J. King. RAINDROP IMPACT AND EROSION ON SOME WESTERN OREGON FOOTHILL SOILS. Agricultural Research Service of USDA, and Dept. of Soil Science, Oregon State University

High energy rains sandwiched into the long, "gentle" rainstorms of the Pacific Northwest can severely erode exposed Willamette Valley foothill soils. More surface runoff and 20 to 50 times greater soil losses were measured from unprotected (bare) vs. screen-covered mini-plots. Thin surface seals from splashed particles, plugged pores and compaction greatly reduced infiltration. Sheet-wash and rilling on susceptible soils appear common. Intensity and energy of rainfall for the area are being characterized (drop size/splash on ozalid paper) for comparison with rainfall patterns east of the Cascades and for potential use in erosion prediction. Common misconceptions about "no erosion problems on Valley agricultural soils" based on over-simplified, too-generalized descriptions of low intensity, low energy PNW rainfall need correction.

179

Hansen, A.J. COMMUNAL NIGHT ROOSTING OF BALD EAGLES IN WESTERN WASHINGTON
Huxley College TON

Three bald eagle (Haliaeetus leucocephalus) communal night roosts were located in the Nooksack River Valley, WA. Vegetative components, geographical factors, effects of human disturbance, and behavioral function were examined. Specific habitat types were used by roosting eagles. The placement of roost sites was found to affect roost location. It is believed that results can be used to communicate knowledge of roost resources.

179

Conover, M.R. & D.E. Miller. STIMULI ELICITING AND ORIENTING PARENTAL PROTECTIVE BEHAVIOR IN GULLS. Zoology Department, Washington State University.

Both the playback of chick calls and the presentation of surgically-devocalized chicks elicited and oriented parental behaviors. However, neither were as effective as a combination of the two. Other factors affecting a parent's reaction to a chick on its territory include the parent's stage in the reproductive cycle, whether other offspring were present, and the chick's location. Gulls whose own chicks were 1 to 2 days old were most likely to accept the test chicks, especially when their own offspring were removed. A chick presented either close to the gull's nest, near cover, or away from any neighboring gull nests also was more likely to elicit parental protective responses and not be attacked.

180

Larrison, Earl J. A NORTH-SOUTH FLYWAY FOR EASTERN NORTH AMERICAN BIRDS THROUGH THE IDAHO-WASHINGTON-OREGON BORDER AREA University of Idaho

Research on a Washington-North Idaho species and subspecies bird checklist has revealed the existence of a north-south migration corridor or flyway through the Rocky Mountain Trench of eastern British Columbia and the border area between Idaho and Washington and Oregon. A number of eastern subspecies and species of birds have been found in this corridor and it explains the recent invasions of blue jays, barred owls, broad-winged hawks, Philadelphia vireos, Tennessee warblers, hoary redpolls, etc. into western northern Idaho and extreme eastern Washington.

181

Rickard, W.H., R.E. Fitzner, and R.H. Sauer, NESTING SUCCESS OF THE CANADA GOOSE ON THE HANFORD SITE Battelle, Pacific Northwest Laboratory

The nesting success of the Western Canada goose, Branta canadensis moffitti, on 20 islands in the free flowing reach of the Columbia River in Benton and Franklin Counties, Washington has been recorded since 1953. Since 1970 the number of nests has declined. The decline is mainly attributed to occuppancy of certain islands by coyotes, Canis latrans. Selective eradicatcn of coyotes is suggested as a way to restore nesting to earlier levels.

182

Frakes, R.A. NICHE SEPARATION IN FIVE SPECIES OF SMALL FLYCATCHERS Washington State University

Five species of small flycatchers (Empidonax traillii, E. difficilis, E. oberholseri, E. hammondii, Contopus sordidulus)are sympatric during the breeding season in southeastern Washington. The four species of Empidonax are generally separated from each other by differences in habitat and feeding ecology. However, in one location E. traillii and E. difficilis were found coexisting in the same habitat, where they have almost identical foraging strategies. This is considered to be an unusual situation for these two species. Contopus sordidulus territories overlap freely with those of E. oberholseri and E. hammondii; however, there are large differences in foraging methods and microhabitat which probably help to reduce interspecific competition in this case.

183

Rajala, J. A. and R. L. Shew SOCIAL IMPACTS FROM WILDLIFE IN THE COLUMBIA BASIN PROJECT Washington State University

Irrigation in the Columbia Basin Project has greatly modified wildlife-oriented recreation. The presence of wildlife, and public use of private farmland for recreation has various social impacts. Landowners, for example, were concerned with maintaining their privacy, but some felt they received favorable recognition for allowing recreational use. Recreationists welcomed the opportunity for wildlife-oriented recreation, but were annoyed with the difficulty of gaining access to wildlife on private property. Field interviews and questionnaires were used to identify social impacts. Knowledge of social impacts will allow the wildlife manager to more effectively communicate with landowners and recreationists.

184

Weisbrod, A.R. & J.A. Dragavon. Mammals of the Nooksack Cirque. USNPS, Cooperative Park Studies Unit, University of Washington, Seattle.

Twenty species of mammals were recorded in the Nooksack Cirque, North Cascades National Park, July and August 1977. Most species were locally scarce in the study area where natural habitat disturbances result from frequent avalanches and rock slides. Peromyscus maniculatus, Clethrionomys gapperi, and Sorex spp. were the most abundant species collected. Analysis shows mammal distributions correlate closely with plant community distributions. P. maniculatus specimens from different plant communities occur in discrete size classes. These size classes may represent two subspecific populations, P.m. austerus and P.m. oreas.

185

Long, Garrell E. CONTROL OF LARCH CASEBEARER POPULATIONS BY DENSITY-DEPENDENT PARASITISM. Dept. Entomology, Washington State University

In 1960, 3 years after discovery of the Larch casebearer in Idaho, the U. S. Forest Service began releasing the host-specific braconid, Agathis pumila. Whether the parasitoid is controlling casebearer population densities in northern Idaho has not been conclusively demonstrated.

Data from parasitoid rearing studies suggest that the rate of attack on the casebearer increases with casebearer density, and that the functional response of the parasitoid is sigmoid in form. Such a functional response could allow the host-parasitoid system to persist indefinitely with host densities regulated at endemic levels.

186

Jackson, David Michael, Codling moth egg distribution and first-instar survival in an abandoned orchard near Pullamn, Washington. WSU.

The distribution of codling moth eggs within trees was examined (1) among all leaf and apple clusters, (2) among clusters containing the same number of apples, and (3) on individual leaves and fruits. These distributions deviated from randomness in all cases. In the field, eggs were aggregated around apples, 51.1% being within 7.5 cm of a fruit, and 91.3% within 20 cm of an apple. The percentage of surviving larvae increased with an increase in the apple density of sample branches, until there was a leveling off around 50% survival for branches with over 30% of their total area being apples. Survival was also related, to a lesser degree, to population density. Individual survival is believed to depend on factors both extrinsic (weather, predation, distance to food upon hatching) and intrinsic (behavioral or physiological) to the larva.

187

Castrovillo, P.J. COURTSHIP BEHAVIORS OF THE CODLING MOTH, LASPEYRESIA POMONELLA L., IN THE LABORATORY. Dept. of Entomology, University of Idaho

Codling moths mating in a laboratory wind tunnel were videotaped. The sequence of events beginning with male approach to within 30 mm of a female and terminating with sexual coupling was analyzed to elucidate courtship behaviors exhibited by each sex. Males were also induced to fly upwind to a synthetic pheromone source and a dead female to test the effect of the presence and location of a visual cue on male orientation.

188

Adams, A.B., D.F. Rhoades, P.R. Vogel, and L.M. Erckmann. DETERRENCY OF A GENERALIST HERBIVORE (MALACOSOMA PLUVIALE CALIFORNICUM) BY ALNUS RUBRA RESIN. Uni. of Washington

The effects of Alnus rubra resin at varying concentrations on the foraging behavior of western tent caterpillar was studied in the field as a function of leafing phenology and in the laboratory via controlled feeding experiments. The resin is a sticky, mainly neutral, substance exuded by the buds, and its residual coats the young developing leaves of alders. Caterpillars were offered agar discs (control vs. varying concentrations of resin), and the results indicate that the resin has deterrent properties at high concentrations, yet at low concentrations (0.5%) this substance makes our lab diet more desirable to the larvae. Field observations gave similar results when crude resin was measured as a per cent of leaf dry weight.

189

Fender, W. M. MIGRATION ROUTES OF NORTHWEST EARTHWORMS
Oregon State University

Nearest relatives of Northwest American endemic earthworms are native to southern Asia, Australia, and New Zealand. Three migration routes are possible: Gondwanaland, Marine Transmigration, and the Bering Land Bridge. This latter was the route of many other organisms of the Vancouveran Province and is considered the most likely route by this author. The lack of related worms in China, Siberia, and Canada is probably due both to glaciation and human disturbance.

190

Moore, A. Kenneth & Mark Plunkett, A COMPARATIVE STUDY OF TEMPERATURE TOLERANCE AND ACCLIMATION IN TEMPERATE AND TROPICAL INTERTIDAL SNAILS
Seattle Pacific University

The zonation and temperature relationships of five intertidal snails (Littorina scutulata, Littorina pintado, Nerita picea, Tegula funebralis, and Thais lamellosa) occuring at different latitudes were studied. It was found that the species living in the upper intertidal zone (L.pintado, L.scutulata) had a higher upper lethal temperature than those from middle (T. funebralis and T. lamellosa) lower intertidal zones (N. picea). In addition it was found that those from the more temperate regions (L.scutulata, T. funebralis & T. lamellosa) exhibit a lower bottom lethal temperature than those from the tropics (L.pintado and N. picea). Temperature appears to influence the intertidal and geographic distribution of intertidal snails.

191

Moore, A.Kenneth & Nancy Ludeman, OSMOTIC STRESS TOLERANCES OF TWO TROPICAL INTERTIDAL SNAILS: LITTORINA PINTADO AND NERITA PICEA Seattle Pacific University

Two marine snails Nerita picea, normally found submerged in tidepools, and Littorina pintado, collected from the splash zone, were maintained in water with adjusted osmolarity ranging from 0 °/oo to 80 °/oo. The times to reach coma and LD_{50} were determined. Nerita had a higher survival rate and fewer individuals entering coma at the lower osmotic pressures (0, 10 and 20 °/oo) than Littorina lived longer and took longer to reach coma at the higher osmolarity (60, 70 and 80 °/oo) than Nertia.

192

Chan, C.Y. CHARACTERISTICS AND SITE OF HABITUATION OF CENTRAL NEURONS MEDIATING TENTACLE RETRACTION IN THE LAND SLUG ARIOLIMAX.
Zoophysiology, Washington State University

Behavioral studies and extracellular stimulating and recording experiments showed that the tentacle retraction reflex in the slug exhibits habituation, dishabituation, spontaneous recovery and learning (cf. Chan and Moffett, 1977. Neurosci. Abs. 3:173). Repeated direct intracellular stimulation of the motoneuron which gives the strongest motor response caused no habituation in all components of the motor pathway including the motoneuronal membrane and the neuromuscular junction, and no muscle fatigue, since neither the motoneuron's spike frequency nor the muscle tension developed declined with repeated direct stimulation. In the afferent pathway, however, smooth decline of somatic unitary EPSPs elicited by repeated stimulation of a sensory nerve indicated that the major site of habituation is at the sensory (not interneuron) to motor synapse.
Supported by NSF Grant BNS76-09706 to S. Moffett.

193

Matlock, Daniel B. THE DEVELOPMENT OF SOMATIC POLYPLOIDY IN A MARINE ISOPOD.
Central Oregon Community College

Tissues from the marine isopod Idothea wosnesenskii (Brandt) were surveyed for the presence of polyploid cells. Large polyploid nuclei were found in the hepatic cecum, gut, and testis sheath. The relative DNA content of these nuclei was measured by two-wavelength cytophotometry. In the adult, only nuclei from the testis sheath formaa doubling series. Hepatic cecum and midgut nuclei range from 32C to 256C, while testis sheath nuclei are distincly 16C and 32C. Ploidization does not begin until the animals leave the brood pouch. Initially, the nuclei conform to discrete DNA classes. Autoradiography indicates that adult testis sheath nuclei continue to synthesize DNA, while nuclei of the other tissues do not. The evidence leads to certain conclusions about the patterns of DNA synthesis in the development of these tissues.

194

Anderson, Bob D. AGE AND GROWTH ASPECTS OF THE RAINBOW TROUT FOUND IN PEND OREILLE LAKE, IDAHO Washington Water Power Company

Scale analysis indicates longevity and size unique to this strain of rainbow trout. Maturity occurs generally at age six and multiple repeat spawning is common. Late maturity combined with an abundant food supply of kokanee results in tremendous size. Individuals maturing at age six averaged 6.34 kg in weight and 774 mm in length while fish maturing at age seven averaged 9.08 kg in weight and 852 mm in length. Growth in length and weight is relatively slow prior to age four, but thereafter increases rapidly as kokanee become the dominant food item. Average back calculated total lengths in mm for ages one through seven are 80, 143, 289, 434, 625, 779, and 852, respectively.

195

Peterson, C.R. COILING AND FEEDING BEHAVIOR IN WANDERING GARTER SNAKES (Thamnophis elegans vagrans)
Department of Zoology, Washington State University

Wandering garter snakes commonly feed on small mammals. Constriction like behavior has been observed in these snakes, both in the laboratory and the field. This behavior was studied with the aid of high speed cinematography and videotape. It is described and compared with that of other colubrid species. The function of the coiling appears to be prey restraint during swallowing rather than prey death. The role of the posterior maxillary teeth and the salivary glands is also considered. Similar behavior may have comprised an intermediate stage in the evolution of constriction in other snake species.

196

Williams, T.A. THE NICHES OF TWO SYMPATRIC TURTLES, Trionyx muticus and Trionyx spiniferus IN IOWA.

Basking, food habits, habitats, and other features of the niches of smooth (Trionyx muticus) and spiny (T. spiniferus) softshells were studied in Iowa. Spiny softshells were found to be more versatile than smooth softshells in basking site selection, distance moved away from rivers, and size of river occupied. Although the same kinds of food were eaten, spiny softshells are primarily benthic feeders and scavengers while smooth softshells feed more in the water column. While niche overlap exists, niches of the two species are clearly different.

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Sanders,M.J. K^+ fluxes in marine fish. Zoology Dept. Washington State Univ.

Two species of marine fish Salmo gairdneri (trout) and Leptocottus armatus (sculpin) were found not to be in a steady state with respect to K ion when kept in experimental aquaria. The magnitude of tracer fluxes(efflux:influx) in 10^{-6}moles $100gms^{-1}$ hr^{-1} is 36:20 for trout and 128:46 for sculpin. The implications of these data will be discussed.

198

Becker, Spencer, Mirosh and Verstrate ADIPOSE TISSUE RELATIONSHIPS IN THE DOMESTIC CHICKEN Washington State University

One hundred male and 100 female chickens were weighed and then dissected at 58-days of age. Males weighed 2365 g and females 1913 g. Abdominal adipose tissue was 2.19% and 2.82%, for intestinal adipose tissue (dry basis) 47.6% and 56.2%, for a segment of the dorsal skin 86.1% and 88.0% and for the eviscerated carcass 12.0% and 13.7% for males and females, respectively. The estimated total adipose tissue in the live bird was 10.4% in males and 12.1% in females.

The correlation coefficients between percent adipose tissue at different locations were high, ranging from 0.76 (males), 0.74 (females) (abdominal-carcass) to a low of 0.46 (male), 0.49 (female) (intestine-skin). The correlation coefficients between percent fat-free live body weight with percent adipose at each location were low -0.12 to 0.35.

199

Moore, A. Kenneth & Nina Boe, UREA METABOLISM AND PROTEIN SPARING IN CITELLUS LATERALIS Seattle Pacific University

Ground squirrels fasted for four days lost 18% body weight. When given urea at 0.3% body weight by intraperitoneal injection at the beginning of the fast the four day weight loss was one-third less. Blood samples were taken and the Serum Glutamic-Oxalacetic Transamiuase (SGOT) was determined. In five of the six squirrels studied the SGOT concentration was greater in the urea injected animals. In vitro studies were performed to determine the transamination activity of urea to amino acid derivatives by SGOT.

200

Winston, M.L. and J.L. Hanegan THE EFFECT OF PARA-CHLOROPHENYLALANINE ON BEHAVIORAL THERMOREGULATION IN THE GERBIL Eastern Washington University

Radio telemetry was employed to continuously monitor the abdominal temperature of 6 male gerbils. The animals were placed in a hot (45°C) - cold (3°C) shuttle box in which the frequency of change and duration of stay in the hot and cold environments were recorded. The frequency of change and duration of time spent in each environment is an estimate of the behavioral component of thermalregulation. These animals were then treated with para-chloro-pheryl-alanine, which blocks the synthesis of 5-hydroxy-tryptamine (5-HT) a putative neurotransmitter of the thermoregulatory system. The animals were again tested in the hot-cold shuttle to determine the role of 5-HT in behavioral thermoreculation.

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